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CARNIVAL ON FLORIDA BEACH.

Steam Gave Way to Gasoline When Distance Was Increased. Speed Better than Two Miles a Minute.

By A. G. BATCHELDER.

ORMOND, FLA., Jan. 29.—Two miles in the minute, first achieved by steam and then improved by gasoline, was the crowning and terminating feature of the fourth annual meet over Florida's great speedway for motor-driven land craft. Marriott guided the newest Stanley *Teakettle* in 59 3-5 seconds, and Demogeot steered the 200-horsepower Darracq in 58 4-5 seconds. Speed that rated 122.44 miles an hour.

Earlier in the meet Marriott had appropriated the sprint honors by a mile in 28 1-5 seconds, at the rate of 127.66 miles, an hour, and a kilometer in 18 2-5 seconds, equal to 121.57 miles, and the interest in the event of the tourney wherein the winner was required to accomplish the sought-for two mile a minute had reached an acute degree.

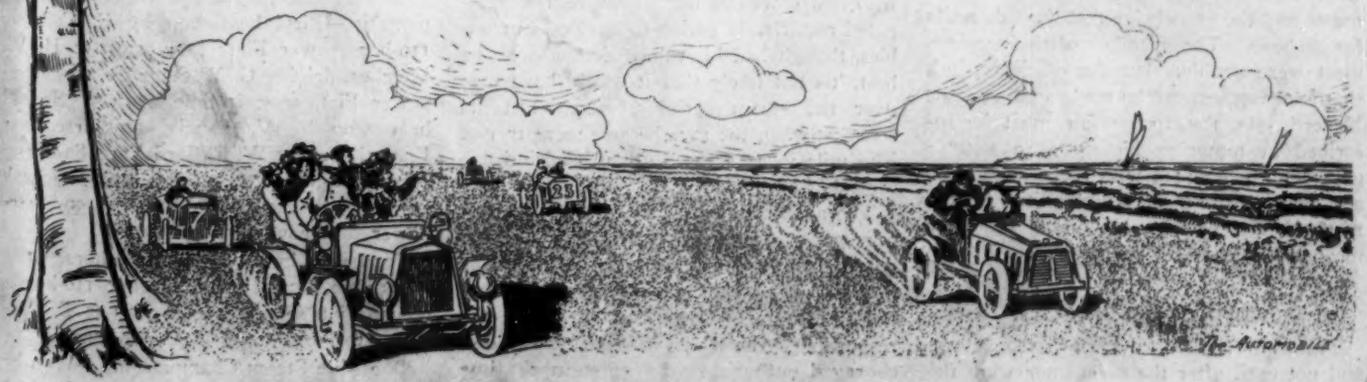
It had been argued by the gasoline adherents that the life blood of the steam skimmer would be exhausted before two miles was covered. The steam contingent held to the contrary, but one lost some faith in the sincerity of their belief when the builder of the freaky *Teakettle* tried to put his gasoline opponent out of the game by questioning its eligibility on the ground that it lacked a differential, an obsolete racing condition abroad, where the car was constructed.

The duel between the pair made a fitting windup and furthermore the contest and the glad sunshine did much to save the meet from a disappointing tinge that had been cast over it by weather and other contrary incidents.

Demogeot, the speed king, received his laurel wreath from Miss Mary Simrall in front of the clubhouse at Daytona, after John Wetmore had eloquently introduced President Asa Paine, of the Florida East Coast Automobile Association, this official congratulating the winners before the crowning ceremony took place. Demogeot was second to the obstinate Hémery in the Darracq employ.

The great motor carnival of 1906 resulted in a wholesale revision of the record slate, the greatest speed attained being well under two miles a minute—to be exact, 127.66 miles an hour.

One of the exasperating disappointments of the meet was the obstinate conduct of Auguste Hémery, winner of the 1905 Vanderbilt Cup race and a driver of international renown. First he got into a squabble at the weighing-in, and, since the truth should be told, one must admit that even a mild-tempered driver might become somewhat excited when his car showed 44 pounds overweight when he positively knew that such could not be the case. This all came about



through an error that had crept into the A. A. A. racing rules and had been copied in the Florida entry blank. The lightweight limit is 881 pounds, and the error made it 851 pounds. Even then the light Darracq was 14 pounds in excess, but this difference was easily possible of correction. Subsequently, when the error became known, Hémery again gladly was considered an entrant in every sense of the word. It had been the manner of his attitude with the weighing-in official more than anything else that caused the intention to suspend him for insubordination.

But the next day, apparently bent on getting into a mess, he refused to re-run a heat of the five-mile championship when the starter had not given the signal and one of the cars had been left at the post. He offered to compete in the final, but this was not permitted, and he was notified to be prepared for the next race in which he was entered. Refusing point blank to obey Referee Morrell, that official immediately suspended him from the rest of the meet, and his case will be considered by the Racing Board in the immediate future.

Then came some cabling from the Darracq company in Paris, the final result being the transfer of the control of the Darracq racers to Mr. Cook, of the American company, and he brought about a sale of the cars to S. B. Stevens, who arranged to have the remaining entries carried out, driving one of them himself in the Corinthian races. Hémery's difficulty with the Italian officials and his brusque behavior at the time of the Vanderbilt Cup race, may have been responsible for a feeling against him, but the Florida officials treated him with the utmost fairness. He was contrary minded, looked for trouble, and secured it. Among those who walked back from Daytona to Ormond in the gathering gloom after the racing of Friday was the now discomfited Hémery, who, with his two companions, unable to command the use of a motor-driven or even a horse-drawn vehicle, sourly strode along, unknown and forgotten.

The weather conditions were not as severe as those of a year ago, but the elements gave much discomfort both to onlookers and participants and made the work of the officials decidedly complex. It is no easy matter to direct contests over a fifteen-mile stretch with continual changes of timing instruments and the knowledge that the tide waits for no man. The mistakes of the previous meet were avoided, but the officials admit that improvement can be made another year. Nevertheless, the 1906 affair must be inscribed in motoring history as a notable gathering, punctuated with remarkable time, and demonstrating speed possibilities for the motor-driven vehicles second to no other means of mechanical traveling.

Story of the Races.

Tuesday supplied a rainy introductory, and not until after the noon hour were the noisy monsters summoned to the fray. Stanley, the champion of steam, confidently sent forth his latest racing creation, one Marriott at the wheel in place of Ross, with whom the builder had had a difference of opinion. Lancia, the daring but beaming Italian, headed the Fiat contingent, which included Mephistopheles, Fletcher and the Vanderbilt Cup Fiat, now owned by George W. Young, and Cedrino, with another 110-horsepower duplicate of Lancia's new craft, besides being entrusted with the Fiat Junior. Earp handled the green-hued Napier, and he and his mechanic, in robes of white, fitted into the clean-looking combination of machinery and men.

This quintette composed the field that thundered and sputtered along the fringe of waves for the Sir Thomas R. Dewar trophy, captured the year before by the rosy-cheeked Ross. Marriott proved a capable successor,

ALFRED G. VANDERBILT ON THE BEACH.

defeating Earp in record time—32 1-5 seconds—in the first heat, and sprinting away from Cedrino in the final, in which Lancia, who had scored in the second heat, participated resultlessly, owing to mechanical troubles, though had his robust demon done its best, 'tis not likely that it would have won over the steam sprinter, which lost its strength when the race became more trying. The mile in 33 seconds found Cedrino five seconds in the rear.

The absentees included the obstinate 250-horsepower brute constructed specially for Alfred Gwynne Vanderbilt by Francois Richard, with the unlucky Sartori impatiently awaiting the spark of life in the unresponsive cylinders. The owner was a discouraged enthusiast who spent much time in the Hotel Ormond garage, watching the array of mechanics who labored hard but seemingly fruitlessly. Hémery, the surly, whose pigheadedness—that is the word exactly—is related elsewhere in this story, was missing with the powerful 200-horsepower Darracq—a space annihilator that might have clipped the wings of the steam-driven flyer.

Henry Ford's nimble eight-cylinder of 105 horsepower did not participate, owing to the clerk of the course's instructions not reaching Kulick, the cautious but fearless Teuton in whom the designer has great faith.

Lancia, rid of the effervescent steam rival, chortled over the mile of sand in the heavyweight gasoline championship, three-fifths of a second in advance of Fletcher with another Fiat, while Cedrino, a third Fiater, was close up. In a trial Cedrino had shown the way to Fletcher, who tried again in the final through being the fastest second car. Earp had succumbed to Lancia in the other heat, the Englishman's craft acting rather erratic, shy a cylinder or two.

What figured as the race for the steam title was a competition only in name. Opposed to Marriott were two other Stanleys, these being catalogued cars. Of course, the squat-built racer ran away from its alleged fellow-contestants like a scared jack-rabbit, bounding over the tide-pounded beach a mile in 31 4-5 and bettering for the second time that day both the accepted MacDonald (Napier) record of 34 2-5 and the unofficial Bowden (Mercedes) mark of 32 4-5. The rate of speed—113.20 miles per hour—was getting close to the hoped-for two miles a minute.

Summary for First Day.

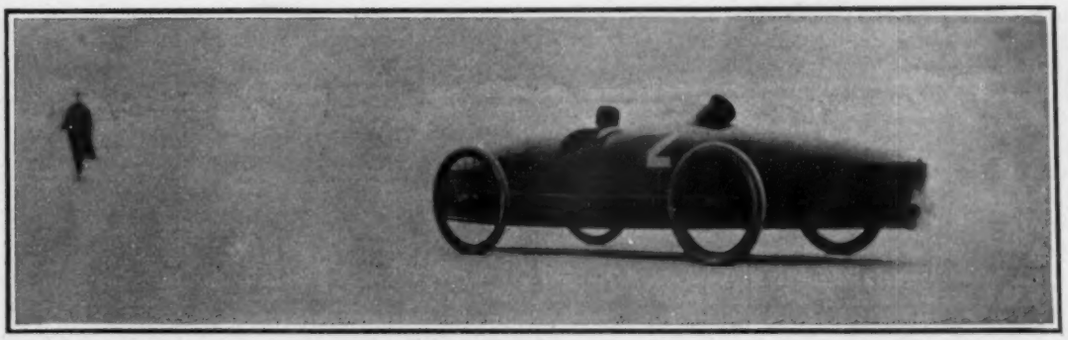
One Mile International for Sir Thomas R. Dewar Trophy.—First heat won by F. H. Marriott, 30-horsepower Stanley; time, 32 1-5; W. Clifford Earp, 80-horsepower Napier, second; time, :40; A. W. Fletcher, driving G. W. Young's 110-horsepower Fiat, third; time, :41. Second heat won by V. Lancia, 110-horsepower Fiat; time, :37 3-5; E. Cedrino, 110-horsepower Fiat, second; time, :38 1-5.

Final won by F. H. Marriott, 30-horsepower Stanley; time, :33; E. Cedrino, 110-horsepower Fiat, second; time, :38; V. Lancia, 110-horsepower Fiat, also started.

One Mile Heavyweight Gasoline Championship.—First heat won by E. Cedrino, 110-horsepower Fiat; time, :39 3-5; H. W. Fletcher, driving G. W. Young's 110-horsepower Fiat, second; time, :39 4-5. Second heat won by V. Lancia, 110-horsepower Fiat; time, :42; W. Clifford Earp, 80-horsepower Napier, second; time, :43 3-5; Joseph Downey, driving J. R. Harding's 90-horsepower Mercedes, also started.

Final won by V. Lancia, 110-horsepower Fiat; time, :37; H. W. Fletcher, 110-horsepower Fiat, second; time, :37 3-5; E. Cedrino, 110-horsepower Fiat, also started.

One Mile Steam Championship.—Won by F. H. Marriott, 30-horsepower Stanley;



STANLEY STEAM RACER WHICH COVERED THE MILE IN 28 1-5 SECONDS AT THE FLORIDA CARNIVAL.

time, :31 4-5; Frank Durbin, 20-horspower Stanley, second.

Wednesday Gasoline Came to the Fore.

Wednesday dawned sullen and forbidding, with a substantial breeze sweeping the beach and coming from the northeast. McMurtry, whose hobby for the moment consists of his very complete timing apparatus, had some wire troubles that delayed the game a bit.

In the five-mile open championship, gasoline took a fall out of steam—and it had been predicted that this would happen when the distance was advanced above the mile. Though Stanley insisted that his craft would figure in other than sprint races, the "speed sharks" had placed the limit of "Teakettle No. 2" at a mile, with a possibility that it might last long enough to do the two miles a minute.

Lancia and his noisy Fiat almost had a walkover in the first heat, Earp's Napier behaving badly. Then once more the churlish Hémery, whose weighing-in misunderstanding with the officials had been amicably adjusted, proceeded to jump over the traces. Hémery, Marriott and Fletcher were drawn for the second heat. Dai Lewis, the jocund starter from Bisontown, could only see two cars as they approached the line—Marriott missing—and so the red flag did not wave. But Hémery started himself, and the lightning Darracq scurried the distance in 2:34—an average of 30 4-5, or 116.88 miles per hour. No, he would not run again, even if the starter gave no signal and another driver had been unfairly left at the post. The heat was re-run, however, minus the crabbed and unreasoning malcontent. Marriott won, Fletcher next; time, 2:47 1-5.

Interest was intense in the final. Marriott had several lengths the best of the start, and the steam craft held the lead well into the concluding half mile, when its strength ebbed and the gasoline antagonists closed in with exuberant mutterings. The "Teakettle" mournfully died away, and the popular Lancia led the sinister Fletcher by a single second at the finish line. There was an after assertion that the steamer had had trouble with a burner.

Earp's Napier came to life in the five-mile gasoline championship, but something went wrong with the Fiats of Lancia and Fletcher, who dropped out of the struggle, and second place went to Joe Downey, with the Mercedes of Mr. Harding, of Boston. Both owner and driver are seeking experience for another year.

The middleweights had a tussle for the five-mile title—Cedrino piloting the Fiat Junior in 3:53 3-5, while "Deacon" Holmes played second violin with the hastily prepared Wayne.

SUMMARY FOR SECOND DAY.

Five Mile Open Championship.—First heat won by V. Lancia, 110-horsepower Fiat; time, 2:54 3-5; W. Clifford Earp, 80-horsepower Napier, also started. Second heat won by F. H. Marriott, 30-horsepower Stanley; time, 2:47 1-5; H. W. Fletcher, driving G. W. Young's 110-horsepower Fiat, second; time, 3:02.

Final won by V. Lancia, 110-horsepower Fiat; time, 3:01 1-5; H. W. Fletcher, 110-horsepower Fiat, second; time, 3:02 1-5. F. H. Marriott, 30-horsepower Stanley, third.

Five Mile Heavyweight Gasoline Championship.—Won by W. Clifford Earp, 80-horsepower Napier; time, 2:56; Joseph Downey, driving J. R. Harding's 90-horsepower Mercedes, second; time, 3:29 1-5; V. Lancia, 110-horsepower Fiat, and H. W. Fletcher, driving G. W. Young's 110-horsepower Fiat, also started.

Five Mile Middleweight Gasoline Championship.—Won by E. Cedrino, 30-horsepower Fiat Junior; time, 3:53 3-5; D. D. Holmes, 50-horsepower Wayne, second; time, 5:46.

S. B. Stevens Successfully Reappears.

Thursday had another lugubrious dawn, and the drizzling rain sadly disarranged plans. The clouds reluctantly ceased in some degree along about noon, and the delayed sport began at the Ormond end.

With a handicap of 25 seconds, because of its lesser price, the Stanley catalogued car hurried down the beach towards Mosquito Inlet, and neither the Wayne nor the

DARRACQ SPRINT-RACING MACHINE WHICH ESTABLISHED THE 2-MILE-A-MINUTE GASOLINE CAR RECORD

Stoddard-Dayton could close up the lead in the fifteen miles run, with the half gale lending aid. The handicappers voted that starts regulated by price of car were weirdly doubtful in obtaining racing results.

S. B. Stevens made his Florida reappearance in the Corinthian ten-mile championship, having only a few hours before bought the 80-horsepower Darracq which the impossible Hémery had been compelled to transfer with the other cars of the same make to Mr. Cook, the American representative of the company. Stevens had a victorious battle with J. R. Harding and a 90-horsepower Mercedes, and then after James L. Breese, with his 60-horsepower Mercedes, had set the pace for C. W. Barron, driving a 90-horsepower Fiat, the citizen of modern Rome (N.Y.) proceeded to take a fall out of the artist of motoring proclivities, the "80" being too much for the "60."

SUMMARY FOR THIRD DAY.

Fifteen Mile Price Handicap, American Touring Cars, Fully Equipped.—Won by Frank Durbin, 20-horsepower Stanley, 25 seconds; time, 13:46 2-5; D. B. Holmes, 50-horsepower Wayne, scratch, and J. E. Bristol, 30-horsepower Stoddard-Dayton, 5 seconds, also started. One second allowance was given for each $100.

Ten Mile Corinthian Championship, Amateur, for the George W. Young Trophy.—First heat won by S. B. Stevens, 80-horsepower Darracq; J. R. Harding, 90-horsepower Mercedes, second. Second heat won by J. L. Breese, 60-horsepower Mercedes; C. W. Barron, 90-horsepower Fiat, second;

Final won by S. B. Stevens, 80-horsepower Darracq; time, 9:28; J. L. Breese, 60-horsepower Mercedes, second; time, 9:47 1-5.

After the ten-mile middleweight title had been annexed by the new-bought 80-horsepower Darracq of S. B. Stevens, driven by Guy Vaughan, and H. N. Harding had scored in the Corinthian handicap with E. W. Sutphen's Daimler, the course was made ready for the clamorous motor giants.

Marriott, whose ability was now recognized, fled down the boulevard of the turbulent Atlantic with the quivering "Teakettle," the McMurtry instrument gleefully firing a shot when the three watches registered 18 2-5 seconds—121.57 miles an hour. This performance erased everything—official, unofficial, and alleged marks—from the time slate.

LANCIA IN THE FIAT ABOUT TO TAKE H. L. BOWDEN FOR A SPIN.

MESSRS. SEBRING, PAINE AND BATCHELDER IN CONFERENCE.

Chevrolet, a favorite who invariably preserves an unruffled exterior under the most trying circumstances, was entrusted with the 200-horsepower Darracq taken away from the choleric Hemery, and over the sands he went with a velocity that measured 19 2-5 seconds in time—115.30 miles in sixty minutes. This now rates as the world's gasoline record.

Earp and his Napier were clocked in :21 3-5; Cedrino (Fiat), in :22 4-5, and Kulick (Ford), in :24 4-5. Then the smaller craft had an inning.

The mile marks were next disturbed. Marriott again excelled with his freak steamer, and when Announcer Earl megaphoned 28 1-5 seconds—127.66 miles an hour, well under the two miles a minute—the shivering onlookers gave an ovation to Mr. Stanley, the proud constructor of the specially built space annihilator, for such it is and good for nothing else.

Chevrolet again triumphed in the gasoline ranks, wherein the cars were such that they could be converted into touring form without much labor. The big Darracq swirled the mile in :30 3-5, thus whipping out the accepted 1905 MacDonald (Napier) :34 2-5 and the unaccepted Bowden (Mercedes) :32 4-5 performance. Cedrino's Fiat did :36 3-5; Earp's Napier, :37 2-5, and Kulick's Ford, 40, with the lighter cars tapering off with new class marks.

SUMMARY FOR FOURTH DAY.

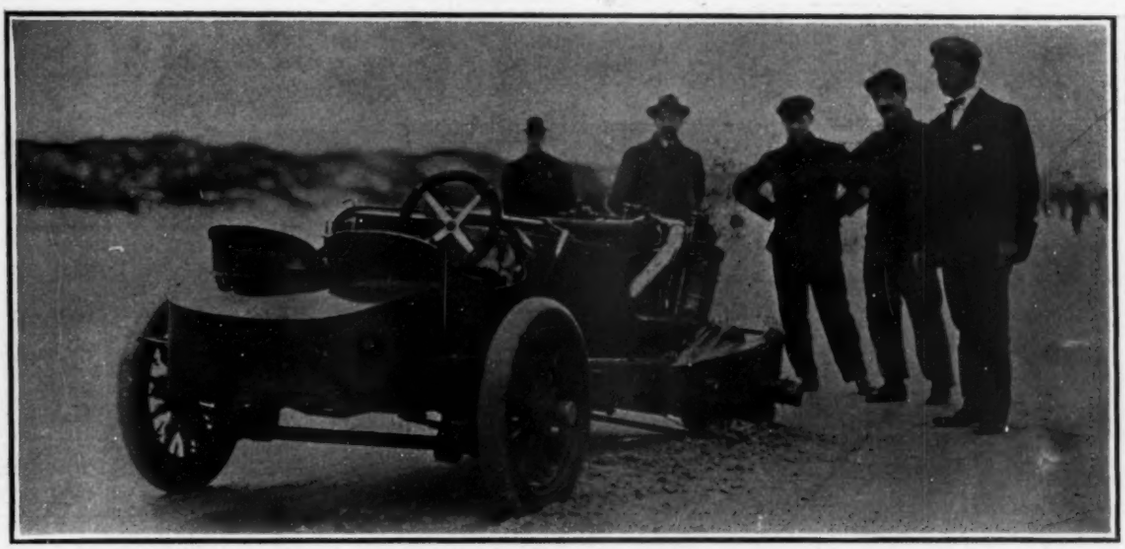
Ten Mile Middleweight Championship (all powers).—Won by Guy Vaughan, driving S. B. Stevens' 80-horsepower Darracq; time, 7:00; E. Cedrino, 30-horsepower Fiat, second; time, 7:50.

Ten Mile Corinthian Handicap.—Won by H. U. Harding, driving E. W. Sutphen's 45-horsepower Daimler, 3 min. 30 sec. allowance; time, 11:18 4-5; S. B. Stevens, 80-horsepower Darracq, scratch, second; James L. Breeze, 60-horsepower Mercedes, 3 min., third.

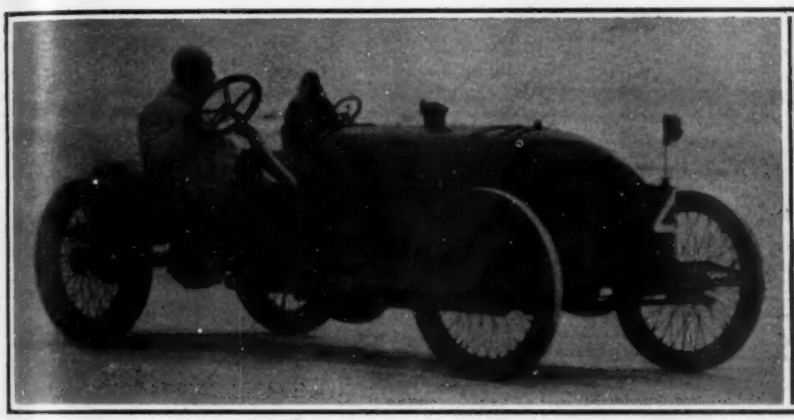
Kilometer Record Trials—Steam (all weights).—Won by F. H. Marriott, 30-horsepower Stanley; time, :18 2-5, world's record.

Gasoline (heavyweight).—Won by Louis Chevrolet, driving S. B. Stevens' 200-horsepower Darracq; time, :19 2-5, world's gasoline record. W. Clifford Earp, 80-horsepower Napier, :21 3-5; E. Cedrino, 110-

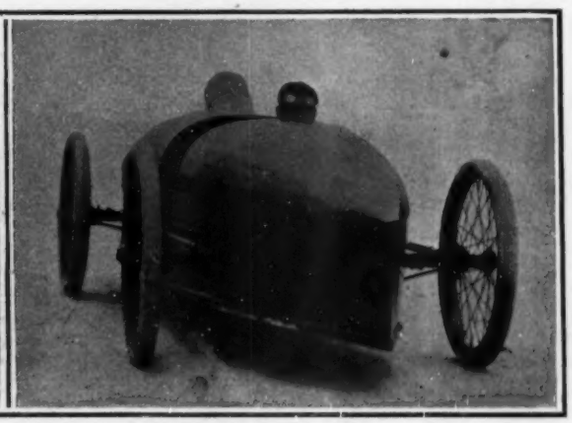
CEDRINO READY FOR AN ATTACK ON THE RECORD IN THE FIAT.



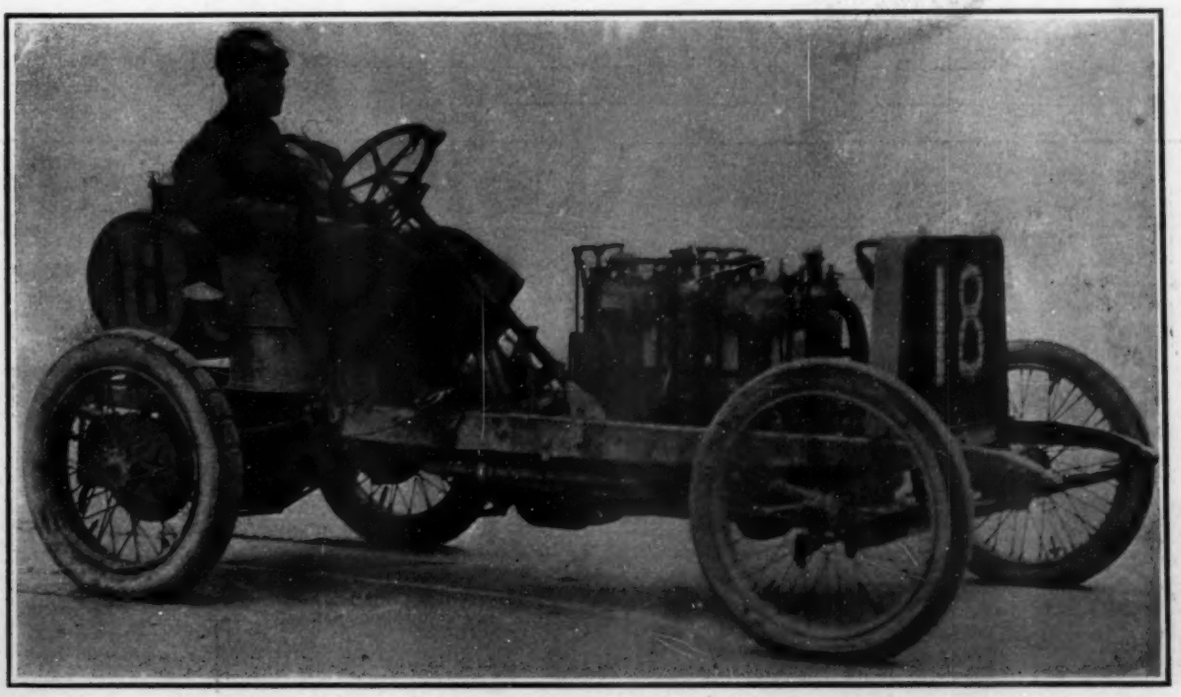
CHRISTIE RACER AFTER THE MISHAP IN WHICH IT LOST THE FRONT RIGHT DRIVING WHEEL.



CLIFFORD EARP AT THE TILLER OF THE BIG NAPIER.



A FRONT VIEW OF THE STANLEY FLYER.



GUY VAUGHAN, WHO WAS APPOINTED SUBSTITUTE DRIVER AT THE WHEEL OF VANDERBILT CUP DARRACQ.

LANCIA, FLETCHER AND EARP STARTING IN THE 5-MILE OPEN—WON BY LANCIA IN 3.01 1-5.

horsepower Fiat, :22 4-5; Frank Kulick, 105-horsepower Ford, :24 4-5.

Gasoline (middleweight).—Won by S. B. Stevens, 80-horsepower Darracq; time, :25; Dan Wurgis, 32-horsepower Reo, :34 4-5; D. D. Holmes, 50-horsepower Wayne, :41 1-5.

Gasoline (lightweight).—Won by C. Fleming, 8-horsepower Maxwell; time, :59.

One Mile Record Trials—Steam (all weights).—Won by F. H. Marriott, 30-horsepower Stanley; time, :28 1-5, world's record.

Gasoline (heavyweight).—Won by Louis Chevrolet, driving S. B. Stevens' 200-horsepower Darracq; time, :30 3-5, new world's gasoline record; E. Cedrino, 110-horsepower Fiat, :36 3-5; W. Clifford Earp, 80-horsepower Napier, :37 2-5; Frank Kulick, 105-horsepower Ford, :40.

Gasoline (middleweight).—Won by Guy Vaughan, driving S. B. Stevens' 80-horsepower Darracq; time, :40 3-5; Dan Wurgis, 32-horsepower Reo, :52 3-5; D. D. Holmes, 50-horsepower Wayne, 1:06.

Gasoline (lightweight).—Won by C. Fleming, 8-horsepower Maxwell-Briscoe; time, 1:29 2-5.

Napier Wins the Hundred Mile.

The original plan of Saturday afternoon called for the disposition of the two-mile-a-minute event, which resolved itself into a

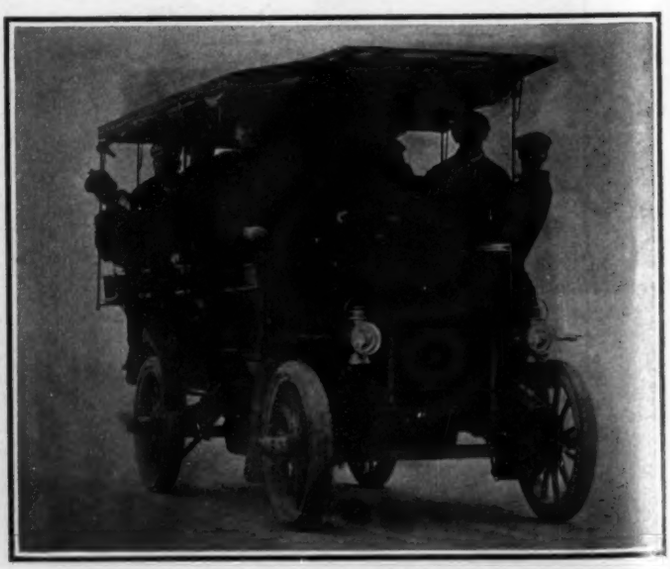
FIAT MAKING A TURN.

duel between the *Teakettle* and the big Darracq, the latter to be driven by Demogeot, one who had been second to Hémery in Darracq employ. After the timing arrangements were completed, Demogeot took a practice run over the beach at terrific speed, and in some manner this unlucky run put the powerful machine temporarily out of business. Then the steam car was given the word, but it had gone scarcely half the distance when it blew out a cylinder-head, and Miss Mary Simrall, the beautiful Ormond girl, who was to have crowned the "Speed King," postponed her pleasing task until Monday.

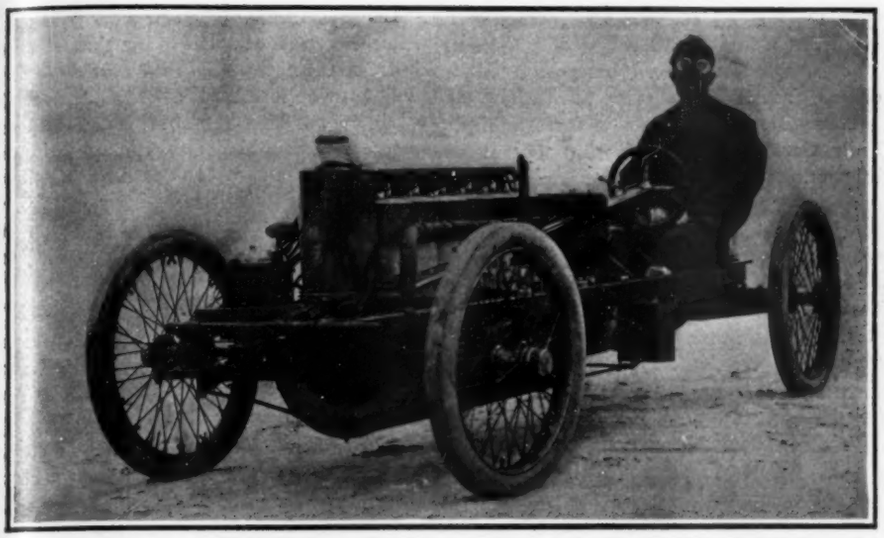
Then came the hundred mile international championship for the Minneapolis cup. The machines were started thirty seconds apart, and seven turns were required to bring the finish in front of the clubhouse at Daytona. W. Clifford Earp and his Napier were first away, followed by Cedrino and a Fiat; then Lancia with another Fiat; next Christie and his *Blue Streak*, W. H. Hilliard and the Mt. Washington Napier, and H. N. Harding and a 40-horsepower Daimler bringing up in the rear.

Earp retained the lead for nearly two circuits, but on approaching the Ormond end for the third turn a rear tire came off, and he had a miraculous escape from capsizing. However, the loss of a tire did not deter him from continuing, and subsequently it

PUSHING AN INANIMATE MONSTER TO THE COURSE.



OLDS WAGON CARRYING REPRESENTATIVES OF THE PRESS.



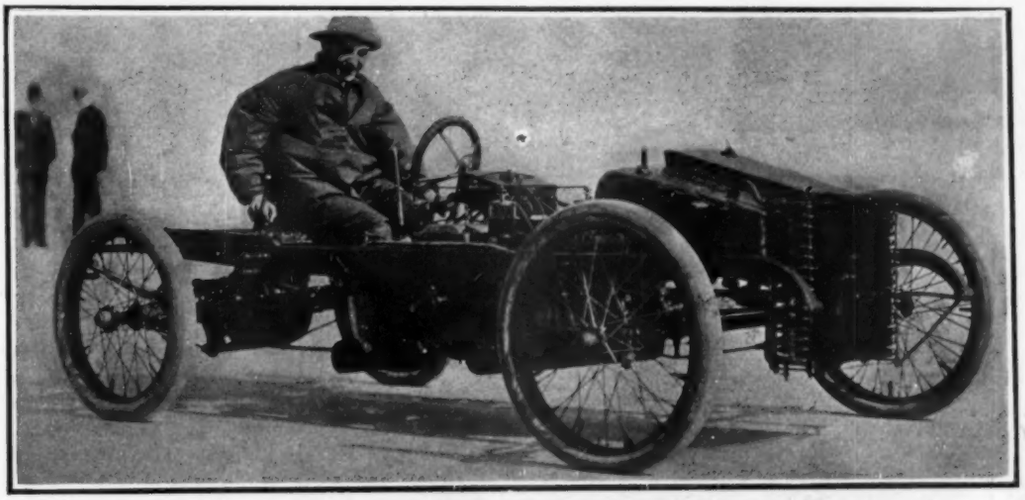
FRANK KULICK AT THE WHEEL OF THE FORD 105-HORSEPOWER RACER.

An amusing feature of the race was that the popular, unassuming Englishman did not know that he had won after passing the clubhouse, and it was only when Mrs. Morrell, the wife of Chairman Morrell, informed him at the Mosquito Inlet turn that he became aware of his victory.

When the big Darracq, with Demogeot, second to Hémery in charge, lined up to start in the hundred, the other contestants filed a protest on the ground that the car did not have a differential. When Referee Morrell learned that the protest was founded in fact, he could not do otherwise than rule out the 200-horsepower craft, much to the disappointment of nearly everybody. Had it been allowed to start, the others were prepared to withdraw.

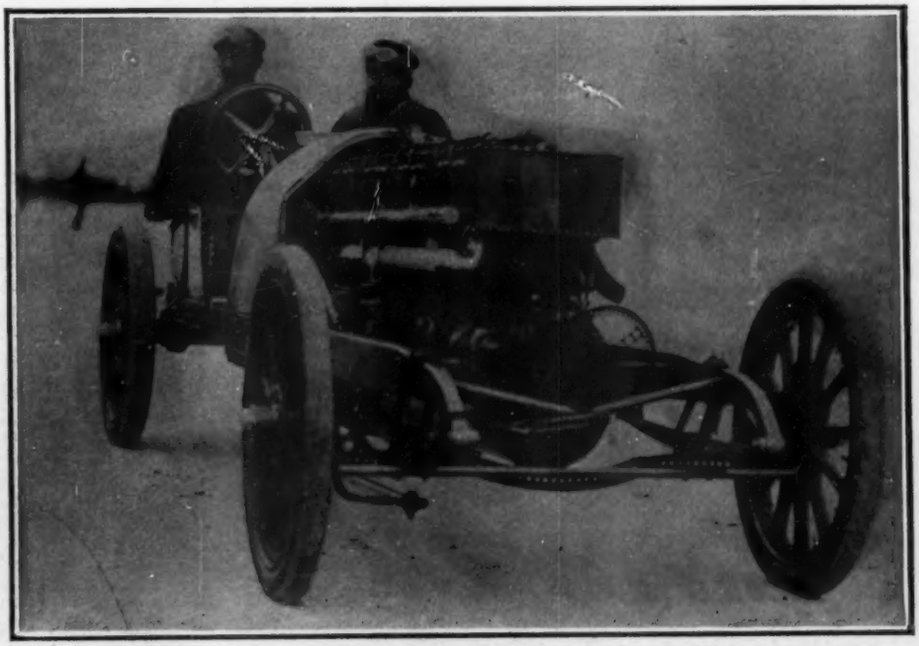
Climax Reached on Monday.

At break of day the racing began on Monday, the session being necessary to leave the afternoon free for the more im-



DAN WURGIS IN THE 32-HORSEPOWER REO RACER ON THE BEACH AT ORMOND.

was learned that he had become aware a couple of days before that he could drive on the sand even with a tire off. Cedrino then assumed the lead, with Lancia at his heels. Lancia's radiator got to leaking, and he was compelled to drop out. Harding also disappeared from the scene, and soon after Christie was missing. In the meantime Earp was holding his own fairly well, despite the handicap under which he traveled. Then Cedrino had his run of ill luck in the form of a damaged tire, with a result that on the concluding run to the Ormond end of the beach the Englishman unexpectedly flashed by the clubhouse in the lead, amid a storm of hurrahs. Soon after came Cedrino in dogged pursuit, but he failed to catch the green-coated Napier before the return to the clubhouse, Earp winning by a minute less 1 3-5 seconds. Hilliard figured as the third finisher, and thereby added to the Napier laurels. The winner's time was 1:15:40 2-5 as against 1:18:24 made by Fletcher a year ago with a De Dietrich. Cedrino's time was 1:16:39, and Hilliards, 1:21:05.



PAUL SARTORI IN THE MOTIONLESS 250-HORSEPOWER SPECIAL RACER OF A. G. VANDERBILT.

portant events. A 30-mile race for American touring cars resulted in a victory for Marriott's steamer, which was five minutes late in starting. The course was from Ormond to the Inlet and return. Christie was well in the lead on the way back when a leaky radiator compelled him to stop for water. Kulick, driving the Ford, ran too high into the soft sand in turning and stuck. Afraid of short circuiting he didn't dare to turn oceanward for the tide was coming in fast.

In the afternoon after the water had receded the racing was renewed. Lancia and the Fiat defeated Marriott and the Stanley in the ten-mile open championship, and the score counted double, for the heavyweight championship was decided by the same race. Lancia had scored in the 15-mile even and to make the measure full he added a unit of the 10-mile handicap.

A. G. Vanderbilt's special racer made its début on the beach but Sartou did not ask to participate in the competition, for the monster moved along at no great speed. The steam and gasoline controversy concluded the day. The beach was none too good and there was no breeze worth noting.

Marriott first did the two miles in 1:03, but Demogeot traveled the distance in 1.01 3-5. Marriott tried again and 59 3-5 resulted amid wild enthusiasm. Demogeot answered with an extraordinary journey in 58 2-5 with a noisy demonstration from the now aroused onlookers. There was a wait of a quarter of an hour to give Marriott a third trial, but before he got ready the recess was over and Referee Morrell called the meet to an end. Mr. Stanley then reappeared saying Marriott was ready, but the wires were disconnected and the sport finished.

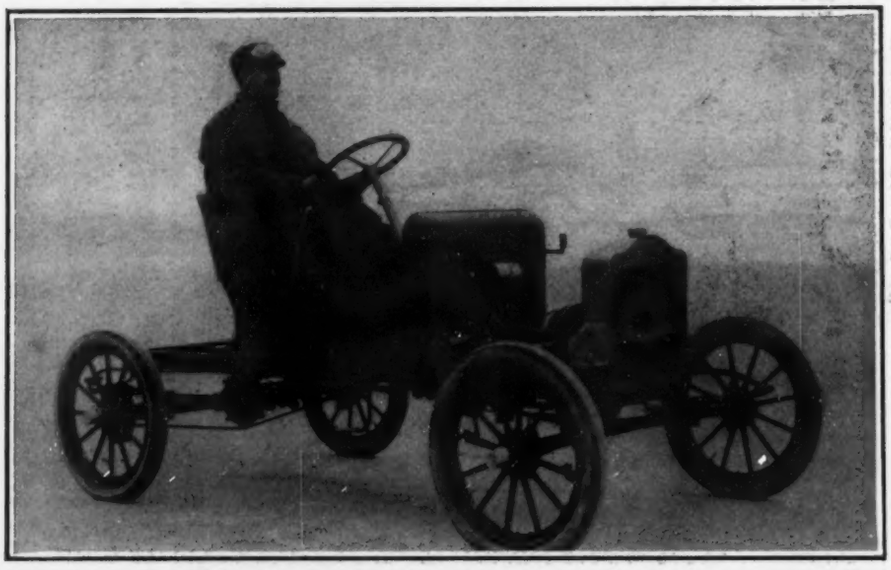
SUMMARY FOR LAST DAY.

Ten Mile Open Handicap.—Won by Lancia (110-horsepower Fiat) from scratch in 6m. 18 2-5s.; Hilliard (80 horsepower Napier), from 1 minute, second, in 8m. 3 4-5s. Harding (90-horsepower Mercedes), from 2m. 48s. start, third.

Thirty Mile Championship for American Built Cars.—Won by Marriott (Stanley) in 34m. 18 2-5s.; Walter Christie (100-horsepower Christie), second, in 37m. 24 3-5s.; Kulick (100-horsepower Ford) did not finish.

Fifteen Mile Championship.—Won by Lancia (110-horsepower Fiat), in 10 minutes, establishing a new record; Hilliard (80-horsepower Napier), second, in 11m. 36 3-5s.; Cedrino (110-horsepower Fiat), failed to finish.

Ten Mile Open Championship, combined with Ten Mile Heavyweight Championship.—Won by Lancia (110-horsepower Fiat), in 6m. 19 3-5s.; Marriott (Stanley), second, in 7m. 35 3-5s. Hilliard (80-horsepower Napier) broke a spark plug.



BENJAMIN BRISCOE DRIVING THE STRIPPED MAXWELL TOURING CAR AT ORMOND BEACH.

One Mile Middleweight Championship.—Walkover for Vaughan (50-horsepower Darracq); no time taken.

Two Mile a Minute Record Trials.—Won by S. B. Stevens' 200-horsepower Darracq, driven by Demogeot, in 58 4-5s.; F. E. Stanley steamer, driven by Marriott, second in 59 3-5s. First trial—Stanley, 1m. 3s.; Darracq, 1m. 1 3-5s.

Picked Up on the Beach.

W. J. Morgan will probably conduct a meet early in April for the Jacksonville Automobile and Motor Boat Club.

Next week will come the Cuban carnival, and many of the Ormond-Daytona performers have gone to the "Pearl of the Antilles."

Alfred Reeves, he of the many irons in the motoring fire, drove a Maxwell-Briscoe before the Thursday wind in 1:14, and now he yearns for a real "red devil."

George Arents, Jr., who nearly lost his life through an accident in the 1904 Vanderbilt Cup race, was one of the officials. Other well-known members of the Automobile Club of America present included Robert Graves, whose Mercedes competed in the 1905 Vanderbilt race; W. Gould Brokaw, unrepresented this time in competition; Charles G. Gates, Andrew Freedman, H. Rossiter Worthington, R. S. Worthington, and M. M. Belding, Jr.

George W. Young's Fiat, driven by Lancia in the Vanderbilt Cup race, went out of business on Thursday when two forward cylinders were blown out while Fletcher was cranking the machine.

Peter Shields, of the Cape May (N. J.) Automobile Club, was an enthusiastic observer of the racing and carried home with him much information that will be utilized for next summer's meets on the Jersey beach.

Frederick L. Smith, the general manager of the Olds Motor Works, contributed to the work of the newspaper men and photographers by supplying a big 'bus which daily made trips up and down the beach solely for those covering the races.

Chairman Robert Lee Morrell, of the A. A. A. racing board, was an energetic referee, whose enthusiasm was communicated to the other officials. His retirement from automobile racing will be much regretted, but he insists that his business affairs now demand all of his spare time.

The deputies that guarded the F. E. C. A. A. clubhouse were conscientious to the extreme. Even Henry M. Flagler, the "King of Florida," was included among those who had to prove who they were. members of American Automobile Association clubs who produced their tickets were granted the usual inter-club courtesies.

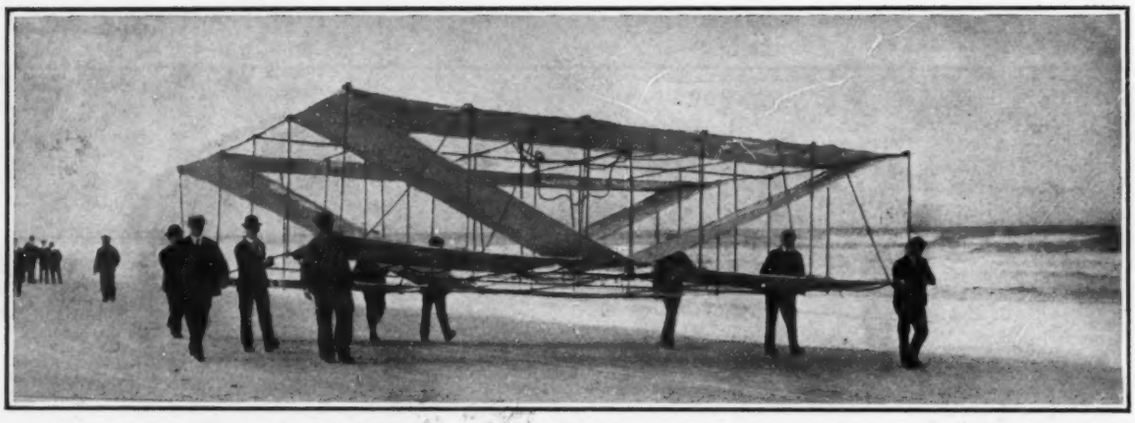
S. M. Butler, president of the Timers Club in New York, was unable to reach the meet until its last day because of winding up the affairs of the Automobile Club of America show. John C. Kerrison, president of the Chronograph Club of Boston; A. L. McMurtry, the inventor of the electric timer used; Walter C. Baker, of the Cleveland Automobile Club, and S. A. Miles, of the Chicago Automobile Club, completed the board of timers.

The Daytona bridges across the Halifax river were subjected to a hard strain. On Wednesday one of the heaviest 'buses caused a couple of the stringers of the middle bridge to sag and the planks also gave way. The result was that the machine thereafter was forbidden to cross the bridges. Later on the same day Pheleg Brown's Cadillac, in avoiding a horse-drawn vehicle, smashed through the railing of the Peninsula bridge. The occupants escaped injury, and the car was hoisted out of the river before the week ended.

Things often happen at the wrong time, and this fact impressed itself discourag-

PICNICKING ON THE SAND DUNES DURING ONE OF THE LONG WAITS BETWEEN RACES AT DAYTONA.

WEIGHING-IN UNDER THE SHADE OF PALMS AND UMBRELLAS—THE BIG DARRACQ ON THE SCALES.



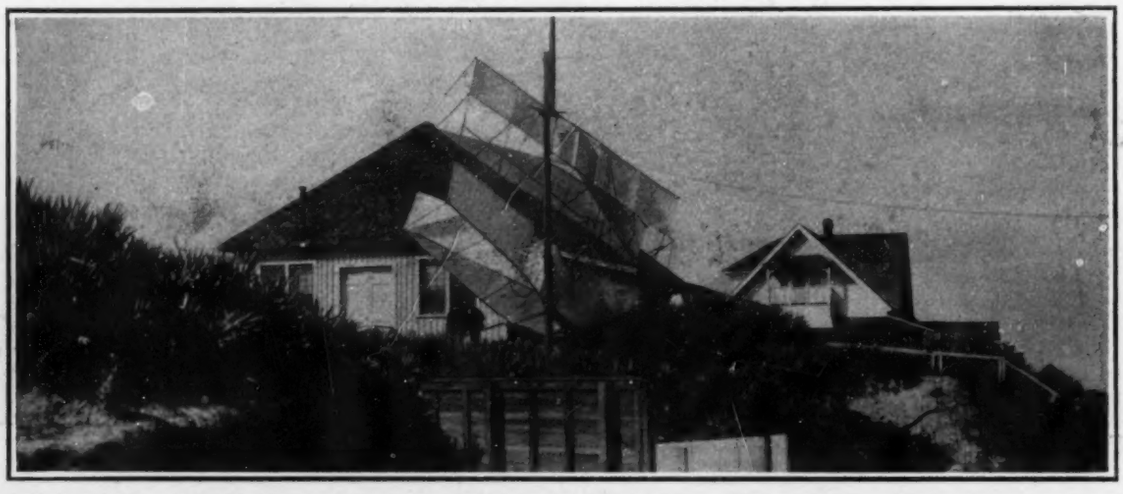
CARRYING THE STEVENS AEROPLANE ON THE BEACH AT ORMOND PREPARATORY TO A FLIGHT. WHEN IN FLIGHT THE APPARATUS WAS TOWED BY AN AUTOMOBILE.

ingly upon Passenger Agent E. V. Stratton, who accompanied the Seaboard Limited that left Sunday noon entirely appropriated by those who had remained for the closing of the shows. A record run was being made, with all aboard happy and content, when the engine suffered a breakdown Monday morning about sixty miles from Savannah. Roadside repairs consumed over an hour, but the train reached St. Augustine in plenty of time for the East Coast connection, and then Stratton smiled again.

H. L. Bowden, whose powerful Mercedes last year made the fastest mile of the meet, this time figured as an associate referee. Paired with him was Frederick R. Pratt, president of the New Jersey State Automobile Association. George L. Weiss, A. L. Riker and F. C. Donald were three members of the Racing Board who contributed conscientious assistance. Frank G. Webb, of the Long Island Automobile Club, did the clerking of the course; D. H. Lewis, of the Automobile Club of Buffalo, made an efficient starter, and Louis R. Smith, of New York City, served as chief scorer.

President Asa Paine, of the Florida association, is a vice-president of the Minneapolis Automobile Club, which wideawake organization filled a special train that journeyed to the meet. Colonel Frank M. Joyce, the club's president, commanded the expedition, which formally presented to the Florida body the handsome Minneapolis cup, the transfer taking place Thursday night at the clubhouse on the beach at Daytona, President Paine entertaining the visitors with a banquet. The Minneapolis delegation was particularly anxious to see the 100-mile race in which the trophy was offered, but they had to leave for home on Saturday afternoon before the event was reached, much to the regret of all concerned. President Paine has proven a most happy choice for the Florida association presidency, and his conduct of matters has been most satisfactory, the utmost harmony prevailing between Ormond and Daytona. W. J. Morgan, the general manager of the Florida tournament, believes that Mr. Paine should be continued in office if he will accept the position again.

The automobile trade was well represented, some attending for business purposes and others simply for the pleasure of seeing the racing. Henry Ford, James Couzens and H. E. Dodge naturally were much disappointed when the Ford racer failed to do all that had been hoped for. H. H. Githens, of the G & J Tire Company, was a happy mortal when the "Teakettle" did its wonderful mile, for it was fitted with the tires of this concern. E. H. Brandt was the Fisk expositor, and Stuart Smith looked after the Continental interests. A. L. Kull, the New York agent for the Wayne, and J. S. Draper, the general sales manager of the company, along with other Wayne agents, made the journey South in a private car. The trade list also included J. E. Maxwell, Benjamin Briscoe and Sales Manager C. W. Kelsey, of the Maxwell-Briscoe Company; H. B. Joy, of the Packard Motor Car Company; Walter C. Baker, of the Baker Electric Company; A. W. Church, of the Decauville Automobile Company; G. H. Tangeman, of the Hol-Tan Company; A. L. Riker, of the Locomobile Company; V. M. Gunderson, of the Northern Company; E. V. Hartford, of the Hartford Suspension; J. E. Demar, of the English Daimler Company; Douglass Andrews, of the Douglass Andrews Company, metropolitan agents for the Berkshire and Bliss cars; H. R. Steenstrup, of Hyatt Roller Bearing fame; Harry Hall, of the Columbia Lubricants Company, and O. J. Mulford, the advertising agent, who handles several automobile accounts.



WHERE THE AEROPLANE CAME TO EARTH AGAIN AFTER COLLIDING WITH A FLAGPOLE. IT HAD MADE A "FLIGHT" OF ABOUT 100 YARDS, CARRYING THE INVENTOR ON A TRAPEZE.

ON THE EVE OF CHICAGO'S DOUBLE SHOW.

CHICAGO, Jan. 29.—In size of its exhibits, in magnitude of its representation of the industrial and commercial interests in the automobile and its accessories, and to these adding another record-breaking feature in the decorative settings for the Fifth Annual Automobile show of Chicago—these are some of the accomplishments bulletined and in process of development for the exhibition which will open here next Saturday.

It is not enough for the size of the show to remark that in adding to the show space the great First Regiment Armory in Michigan avenue the Chicago show will have 34,000 more square feet than last year were occupied in the 55,663 square feet of the Coliseum and its annex. That almost every available square foot of space was awarded before November 1 last is a more striking commentary upon the size of the exhibition, while the fact that in the last two weeks an average of ten letters a day have been written by the management, announcing that not another square foot is to be had by automobile manufacturer or by maker of accessories, is suggestive of the need for still another show place in the Coliseum neighborhood. Five insistent manufacturers of cars have been unable to secure space, while ten accessories makers have been unable to find room.

Space has been allotted for more than 100 makes of cars, and in the galleries of the two buildings makers of parts and of accessories have had 150 spaces set aside for exhibits. For cars and for the no less interesting accessory parts of cars the decorative scheme in two great buildings are on a scale not yet approached by any Chicago exhibition. In the lofty roofs banners of old gold and pure white, and draperies to correspond will soften the hard lines of steel architecture. Pillars of white staff will mark the boundaries of the spaces, and above them are cornices and entabulatures in staff showing the signs of the exhibitors. Silk banners three feet in length will depend from the cornices, each letter in the sign hanging from an individual enamel shield. Everywhere electric bulbs and clusters are arranged to give the buildings such floods of light as have not been seen at any other show.

Side walls are covered with panelings of Flemish oak on green and old gold ground and above these decorations the light bulbs will project from a trimming of white staff, with the effect everywhere of turning the bald necessities of monster architecture into an art background for an exhibit representing $1,000,000 worth of manufactures.

Almost every foreign car of the Eastern shows will be here. More than a score of Western manufacturers who were absent from the Eastern exhibitions will be represented. A few of the Eastern builders will be absent, but for the absentee Eastern man, five Western builders are coming, and in contrast to the two rival shows in New York, the Chicago exhibition will have two big shows that are co-ordinate and under the one management and the one ticket of admission. With the Coliseum exhibit in Wabash avenue, only one square west of the Armory exhibit in Michigan avenue, the two shows are almost as closely united as if they were under the same roof. The Michigan avenue building is one of the handsomest and most imposing of its kind, and, facing Michigan avenue, the boulevard of boulevards for the autoist, it becomes a good deal more than a makeshift side show for the Coliseum main feature place for the Chicago show.

When the fifth annual show shall open Saturday morning it will be after a leeway of only fifty-two hours for the making ready and placing of exhibits. Systematized system will have been exploited to the limit in thus making ready. A small army will have found the work of the stage scene-shifter imposed upon it. A ball and a later drill of the First Regiment will have held the Armory from the decorators, while the record-breaking crowds at the Electrical show in the Coliseum will have held the former show place full.

As a feature of the show that is to be the fullest and most spectacular in Chicago, the exhibits of the commercial cars will be an innovation. The growth of the commercial car in the last year will be marked in the exhibition as it has been marked in the trade. The horseless delivery wagon and van and truck have been only a little less noticeable in Chicago than in New York, and the Western manufacturer will demonstrate his interest in that future field of the automobile.

Refinements in mechanical construction and elegance and luxuriousness in bodies of passenger cars will be distinctive marks in that line of exhibits. The chassis will show few changes for the West.

Chicago weather should be promising for the show week. The remarkably open winter has brought few days when automobiling in Chicago streets was not a recreation, and, if immunity shall be continued, the elements will lend to an exhibition which the management looks to as unexampled in attendance and interest.

Official List of Exhibitors at Chicago Auto Show.

American Motor Car Co., Apperson Brothers Auto Co., Aerocar Co., Auburn Auto Co., Austin Auto Co., Autocar Co.

Baker Motor Vehicle Co., Bartholomew Co., The, Buick Motor Car Co.,

Columbus Buggy Co., Cadillac Auto Co., Corbin Motor Vehicle Co., Chicago Pneumatic Tool Co., Chicago Auto Mfg. Co.

Detroit Auto Vehicle Co., Duryea Power Co., Dorris Motor Car Co.

Electric Vehicle Co., Elmore Mfg. Co.

Franklin Mfg. Co., Ford Motor Co.

Harrison Wagon Co., Harley-Davidson Motor Co., Haynes-Automobile Co., Holsman Auto Co.

Jackson Automobile Co., Jeffery, T. B. & Co.

Knox Auto Co.

Locomobile Co. of America.

Mitchell Motor Car Co., Maxwell-Briscoe, Motor Co.

National Motor Vehicle Co., Northern Mfg. Co., Nordyke & Marmon Co.

Olds Motor Works.

Packard Motor Car Co., Peerless Motor Car Co., Pierce, The Geo. N., Co., Pierce Engine Co., Pope Motor Car Co., Pope Mfg. Co., Premier Motor Mfg. Co., Pungs-Finch Auto & Gas Engine Co.

Reliance Motor Car Co., Royal Motor Car Co.

Stearns, F. B., & Co., Stevens J., Arms & Tool Co., St. Louis Motor Car Co., Studebaker Auto Co.

Thomas, E. R., Motor Co., Tincher Motor Car Co.

Vehicle Equipment Co.

Waltham Mfg. Co., Wayne Auto Co., Welch Auto Co., Windsor Auto Co., White Sewing Machine Co., Winton Motor Carriage Co., Woods Motor Vehicle Co., Werner, Oscar.

American Electrical Novelty & Mfg. Co., Atwood Mfg. Co., Autocoil Co., Aurora Automatic Machinery Co., Automobile Supply Co.

Badger Brass Mfg. Co., Baldwin Chain & Mfg. Co., Beckley-Ralston Co., Belden Auto Transmission Co., Brennan Mfg. Co., Bowser, S. F., & Co., Briscoe Mfg. Co., Brown, Wm. H., Brown-Lipe Gear Co., Byrne, Kingston & Co.

Cook Ry. Track Appliance Co., Chicago Battery Co., Continental Caoutchouc Co., Consolidated Mfg. Co., Cullman Wheel Co.

Dac Automobile Supply House, Dayton Electrical Mfg. Co., Dayton Folding Tonneau Co., Dietz, R. E., Detroit Motor Car Supply Co., Detroit Steel Products Co., Diamond Chain & Mfg. Co., Diamond Rubber Co., Dixon, Joseph, Crucible Co., Duff Mfg. Co., Duplex Coil Co.

Edmunds & Jones Mfg. Co., Excelsior Supply Co.

Firestone Tire & Rubber Co., Fisk Rubber Co.

Gaulois Tire Co., G & J Tire Co., Goodrich, B. F., Co., Gabriel Horn Mfg. Co., Goodyear Tire & Rubber Co., Gray & Davis.

Hardy, R. E., Co., Harris, A. W., Oil Co., Hartford Rubber Works Co., Hartford Suspension Co., Hendee Mfg. Co., Hine-Watt Mfg. Co., Hyatt Roller Bearing Co.

Imperial Brass Mfg. Co., International A. & V. Tire Co., Jones Speedometer.

Knoblock-Heideman Mfg. Co.

Limousine Carriage Mfg. Co., London Auto Supply Co., Long Mfg. Co.

Madison Kipp Mfg. Co., Morgan & Wright, Manhattan Storage Co., Motor Car Equipment Co., McCord & Co., McGiehan Odometer & Mfg. Co., Motsinger Device Mfg. Co.

National Carbon Co., N. Y. & N. J. Lubricants Co., North Chicago Machine Co.

Oliver Mfg. Co.

Pantasote Leather Co., Pennsylvania Rubber Co., Prest-O-Lite Co.

Railway Appliances Co., Remy Electric Co., Republic Rubber Co., Rose Mfg. Co.

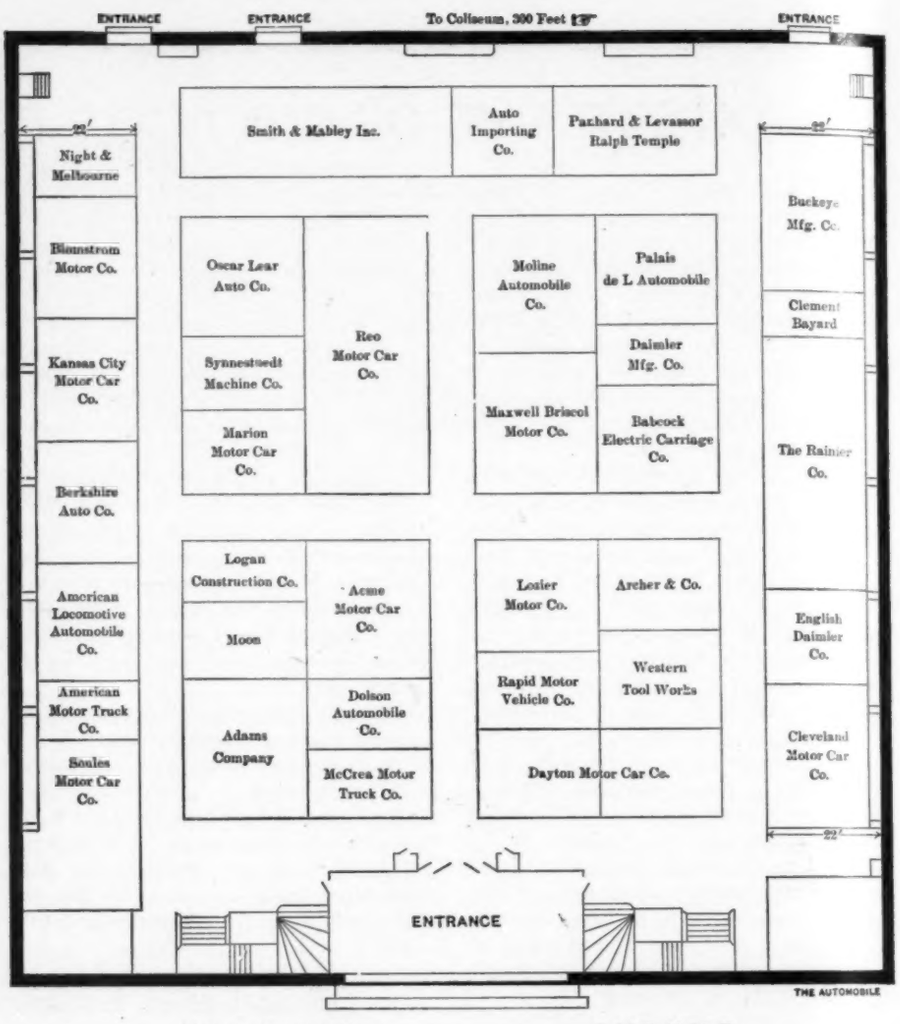
Samson Leather Tire Co., Shelby Steel Tube Co., Sherwin-Williams Co., Splitdorf, C. F., Sprague Umbrella Co., Spicer Universal Joint Mfg. Co., Standard Carriage Lamp Co., Standard Oil Co., Standard Roller Bearing Co., Steel Ball Co., Schwartz Wheel Co., Swinehart Clincher Tire & Rubber Co.

Timken Roller Bearing Axle Co., Tokheim Mfg. Co.

Universal Electric Storage Battery Co.

Valentine & Co., Veeder Mfg. Co., Vesta Accumulator Co., Volta Battery Co.

Warner Gear Co., Warner Instrument Co., Webb Co., Windsor Auto Co., Wheeler Mfg. Co., Weed Chain Tire Grip Co., Whiteley Steel Co., Whitlock Coil Pipe Co., Whitney Mfg. Co., Wray Pump & Register Co.

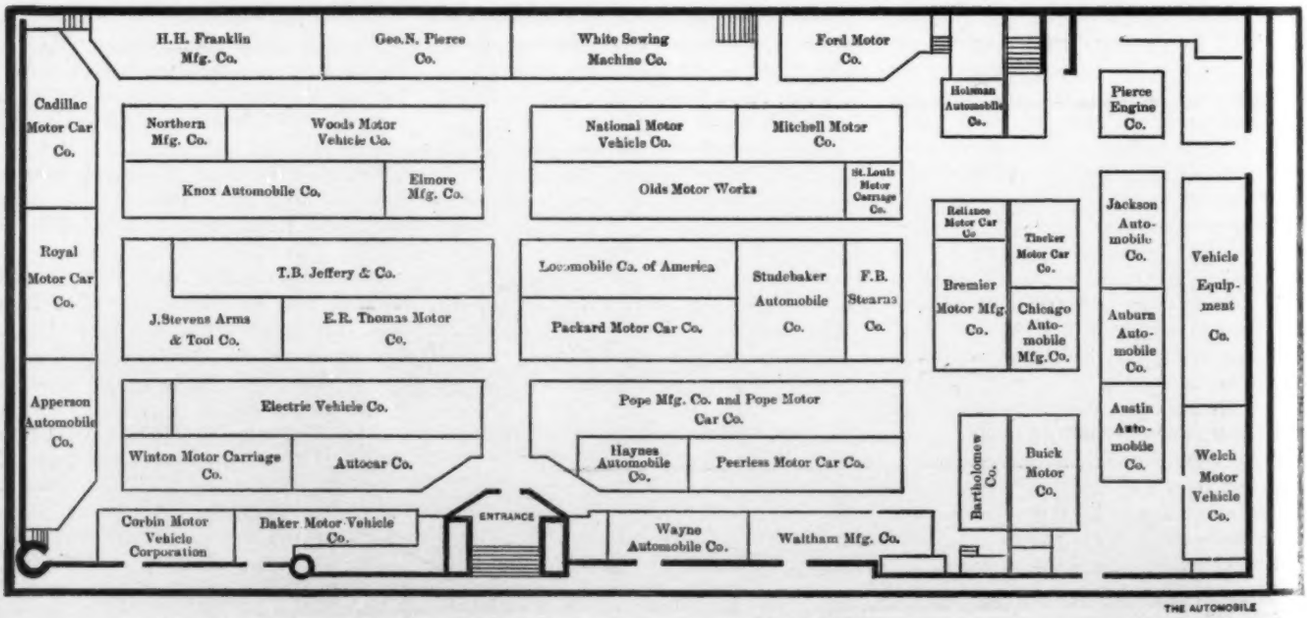


MICHIGAN AVENUE

MAIN FLOOR OF THE 1ST REGT. ARMORY SHOWING LOCATION OF EXHIBITORS' STANDS.

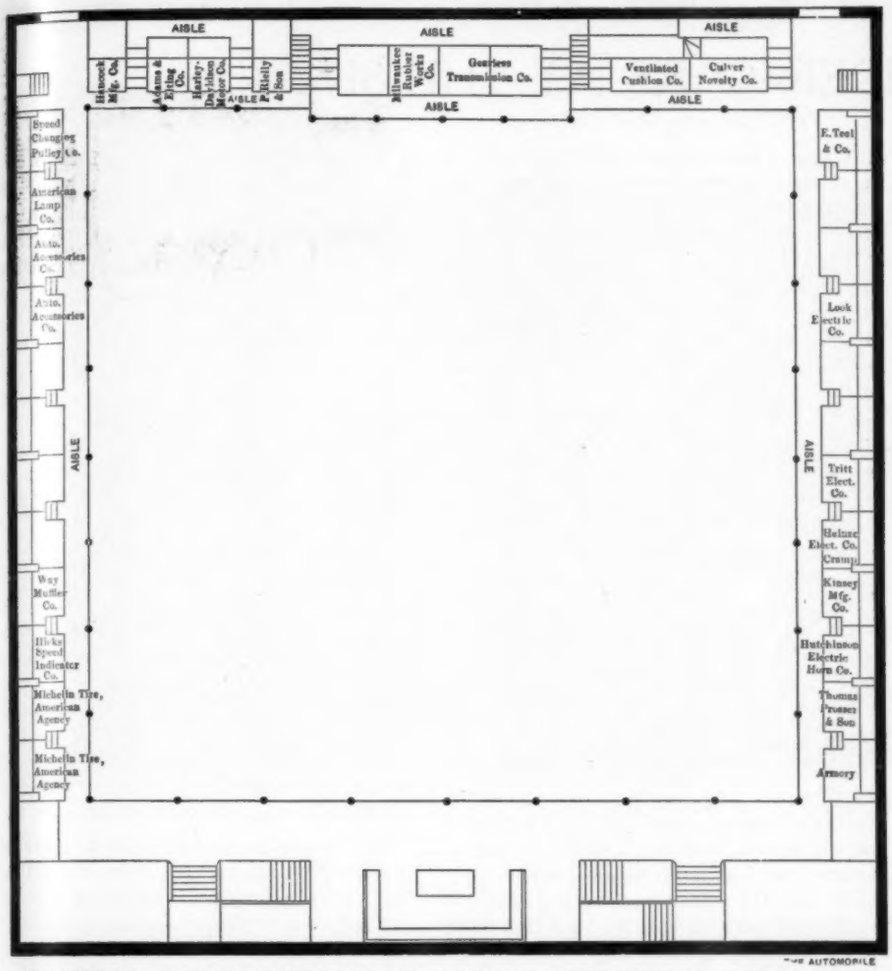
Adams Co., The, Acme Motor Car Co., Automobile Co., American Motor Truck Auto Importing Co., American Locomotive Co., Archer & Co.

Buffalo Electric Carriage Co., Buckeye



WABASH AVENUE

MAIN FLOOR OF COLISEUM AND ANNEX WITH LOCATION OF EXHIBITORS' STANDS FOR CHICAGO AUTO SHOW.



GALLERY IN 1ST REGT. ARMORY SHOWING STANDS OF ACCESSORIES AT CHICAGO SHOW.

Mfg. Co., Blomstrom, C. H., Berkshire Automobile Co.

Cleveland Motor Car Co.

Dolson & Sons, Daimler Mfg. Co., Dayton Motor Vehicle Co.

English Daimler Co.

Knight & Kilbourne, Kansas City Motor Car Co.

Logan Construction Co., Lozier Motor Co., Lear, Oscar, Automobile Co.

Michaels, H. S. & Co., Moon Motor Car Co., Marion Motor Car Co., Maxwell-Briscoe Motor Co., Moline Automobile Co., McCrea Motor Truck Co.

Palais de l'Automobile, Panhard & Levassor.

Reo Motor Car Co., Rapid Motor Vehicle Co., Rainier Co.

Synnestvedt Machine Co., Smith & Mabley, Inc., Soules Motor Car Co.

Western Tool Works.

American Lamp Co., AUTOMOBILE, THE, Adams & Elting Co., Auto Accessories Co., Arnstein, Eugene.

Cramp, Cycle and Auto Trade Journal, Culver Novelty Co.

Gearless Transmission Co.

Hancock Mfg. Co., Heinze Electric Co., Hutchinson Electric Horn Co., Horseless Age, Hicks Speed Indicator Co.

Kinsey Mfg. Co.

Look Electric Co.

Milwaukee Rubber Works Co., Michelin Tire American Agency, Motor Age.

Prosser, Thomas, & Son.

Reilly, P. & Son.

Speed Changing Pulley Co.

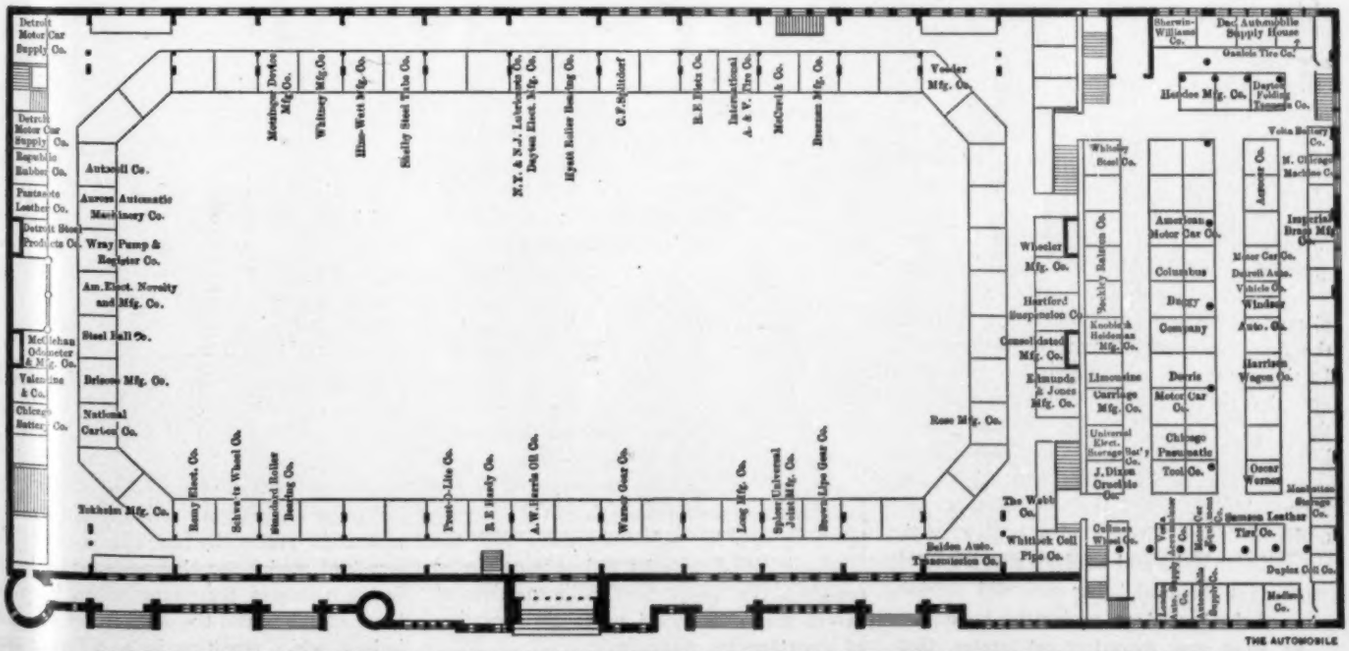
Teel, E., & Co., Tritt Electric Co.

Ventilated Cushion Co.

Way Muffler Co.

While the shows are on in Chicago a searchlight will be operated from the roof of the Coliseum, lighting the path of intending visitors to the shows.

A few days ago W L. Shepard, of Melrose, Mass., placed his Winton car in the fire department service with good effect. A hose wagon, responding to a call, hit a tree, losing a wheel. Mr. Shepard, who was following closely, took the firemen and chemical extinguishers aboard his car and reached the fire before any of the regular apparatus.



GALLERY AND SECOND FLOOR OF ANNEX IN COLISEUM WITH LOCATION OF EXHIBITORS' STANDS FOR CHICAGO SHOW.

SIX-CYLINDER CARS AT THE SHOWS.

In answer to the demand for an increase of power with at the same time an increase of flexibility, a number of manufacturers have this year placed in the market cars with motor equipment of an added number of cylinders. The number of regular models on exhibition at the recent New York shows in which the power plant was composed of six cylinders happened to be exactly six, giving the buyer of high-powered cars of this type an option of an even half dozen makes.

While one of these was an English built machine, the six-cylinder Napier, it is the intention of the American Napier Co. to at once begin the manufacture of this highly specialized model, and to that end a number of "sixes" are already in hand, with prospects of an early delivery to customers. It is not to be expected that a great number of cars of this type will be turned out, but the Napier six will be a regular model made in this country, and hence entitled to inclusion in the list of bona fide commercial products of the year.

The prime object of an increase of the number of cylinders, is to provide a more even torque for the engine shaft than is possible with a four-cylinder four-cycle type of motor. Under the most favorable working conditions the four-cylinder motor with cranks set at an angle of 180 degrees gives a tangential pressure on the crank pin with a maximum effort at diametrically opposite points around the circular line of travel of the crankshaft. In the four-cylinder motor there must necessarily be two "dead centers" or points where the tangential pressure is nil. The six-cylinder motor, on the other hand, provides a series of three efforts, which spaced around the line of travel of the crank pin "overlap" and cause the disappearance of the dead center found in the four-cylinder type.

A still further increase on the number of cylinders, say to eight, will not provide as great a proportionate gain over the six as the six provides over the four. Other factors entering into the problem are adequate cooling, flexibility of the motor and weight, added complication (really multiplication) being justified in the opinion of the manufacturers of motors of this type. In the matter of cooling it is interesting to note that two of the six-cylinder cars shown this year are cooled by air, one the Franklin, by means of a flywheel fan supplementing the fan in front and the other, the Frayer-Miller, by a blower forcing air under pressure directly into contact with the cylinder walls and heads, a supplemental fan in the flywheel being provided to dispose of the heated air under the hood.

At least one manufacturer states that the six-cylinder is the logical outcome of a demand for a car of higher power than the regular four-cylinder model, problems of a serious nature suggesting the addition of two cylinders rather than the increase in size of the usual four. A comparison of the two models of this maker, the four and the six, shows many points common to both, but a ride in each car is a better demonstration than hours of critical examination. The six is by far the more flexible and responsive to spark and throttle control, the feeling of a reciprocating motor is almost lost sight of—in fact, the engine has a "feel" about it as though it might be a rotary or turbine rather than a reciprocating mechanism with six pistons each making two complete stops to each revolution. The most marked sensation is one of perfect engine balance, and naturally this condition must result with material benefit to the driving effort transmitted to the rear wheels of the vehicle.

In a ride through crowded streets in another six, the flexibility of the motor was also marked and the change speed device seemed almost a superfluous mechanism, the car accelerating from a slow crawl on top speed gear engagement to maximum speed by means of gas and spark control. Starting with high speed in engagement is an easy "stunt," but not a particularly good practice to follow, and of no practical merit.

The elimination of change speeds is urged as an argument in favor of the six-cylinder, but from all available sources of information it would seem that no manufacturer here or abroad has seen fit this season to take this radical step, the nearest approach being found in an English car which is provided with a low speed for emergencies and a top speed on direct drive. The conditions found in average touring may admit of driving continuously for great distances on third speed, or fourth, when as many changes are fitted, but the probabilities of the change speed being eliminated from cars with six-cylinder motors are remote.

In an effort to offset the multiplication of parts necessitated by the use of six cylinders, a reconstruction of the motor has been made in several instances and the piping and valve disposition considerably simplified. This is particularly noticeable in the new Napier. Last year the Napier six, while a satisfactory car in regard to performances and upkeep, provided a power plant with multiplicity of parts. The overhead tappets for valve actuation and the arrangement of the inlet and exhaust piping rendered the adjustment or inspection of valves and other vital parts an operation of considerable difficulty.

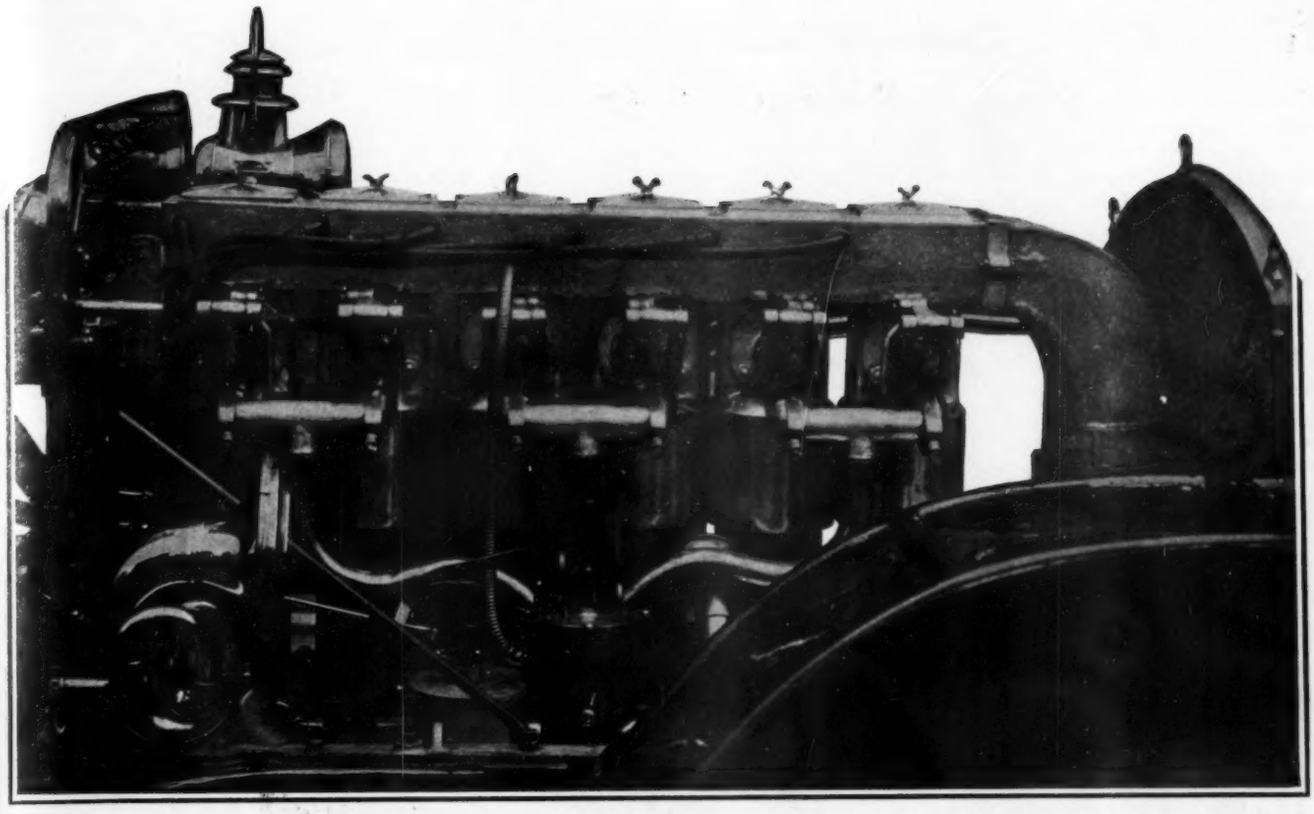
The 1906 model shows a clean-cut motor with valves disposed on one side of the motor, side by side in gangs of four, the cylinders being cast in pairs with symmetrical and conventional lines. While a single camshaft actuated both inlet and exhaust valves in the model of last year, the overhead tappets and long push rods have disappeared, giving the motor a clean workmanlike appearance. By placing the inlet valves together, with exhausts at either side, the design of the inlet piping from the carbureter to the valve chambers is simplified and equal gas travel provided for each cylinder.

The motor has 5 by 4-inch cylinders and is rated at 60 horsepower. Air supply to the carbureter is under hydraulic control and is automatically handled by the movement of a diaphragm under pressure from water in a shunt pipe from the circulating system, the diaphragm action varying according to the pressure of the water as delivered by the rotary pump. The ignition, known as the Napier synchronized system, provides a jump-spark from a low-tension magneto through a single coil.

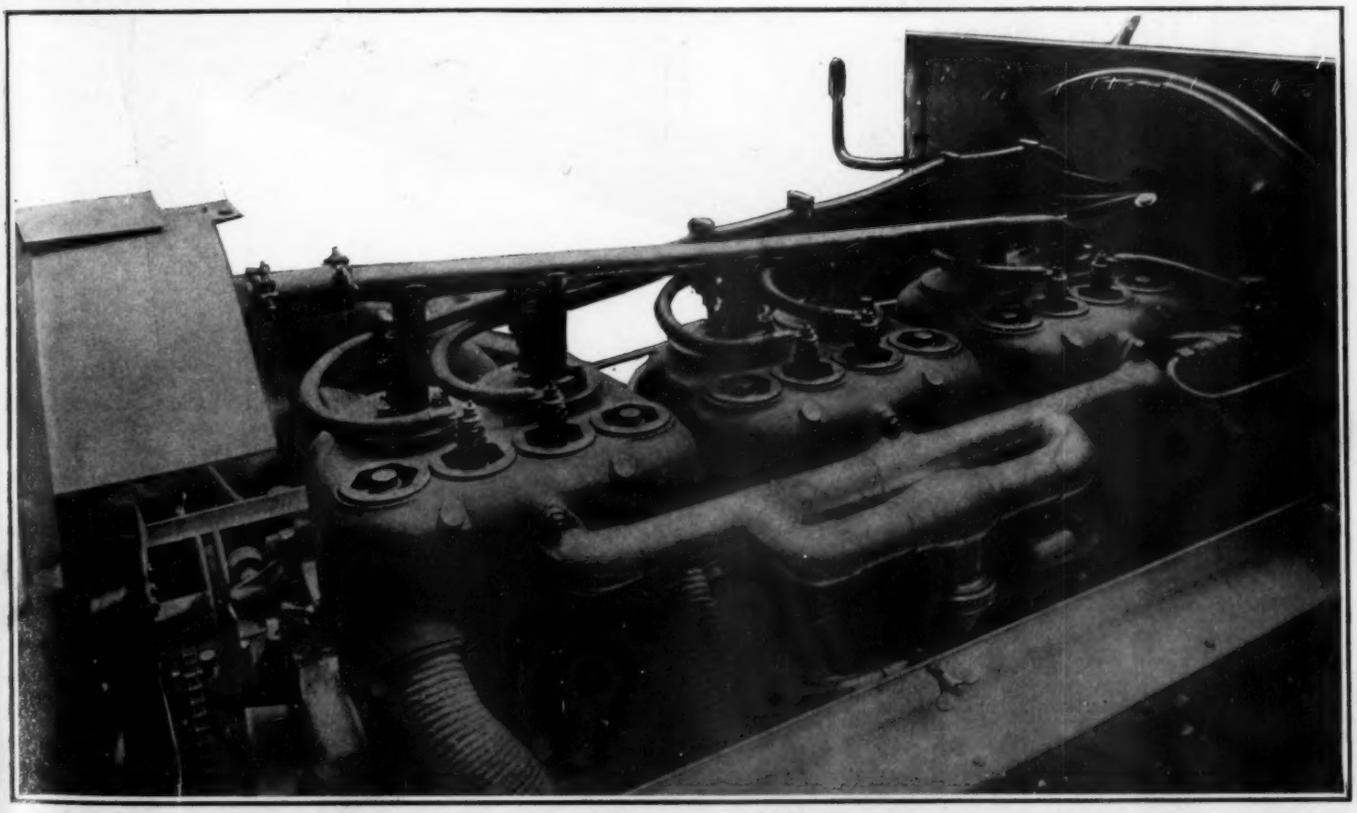
The mechanism is located in a handsome box on the dash and the movement of the high and low-tension distributer for advancing or retarding the spark is obtained by revolving the top half of the vertical driving spindle independently of the lower part, the spindle being in two parts with the lower members terminating in a sleeve in which is a coarse spiral thread. A feather is provided on the top member and vertical motion of the threaded collar is obtained through the medium of suitable connections with a lever on the steering wheel. Elevation or depression of the collar causes the feathered spindle to revolve, so that the position of the contact plates is changed and the moment of firing advanced or retarded.

The change speed mechanism gives three forward speeds and the usual reverse, the final drive being through a propeller shaft and bevel gears to the rear axle. Ball bearings are used in the transmission case and front wheels, with roller bearings for the rear live axle.

One of the earliest, if not the very first concern, to take up the construction of the six-cylinder motor in a commercial way is the Oscar Lear Automobile Co., makers of the air-cooled Frayer-Miller. This car has been well known as a four-cylinder and, by reason of a novel means of air-cooling, has attracted wide attention. The six-cylinder model is practically an extension of the standard model, the changes such as longer frame members, the strengthening here and there of parts and the addition of two cylinders, while resulting in a different type



RIGHT-HAND SIDE OF FRAYER-MILLER SIX-CYLINDER AIR-COOLED MOTOR SHOWING AIR-DUCT CONNECTING TOPS OF CYLINDER JACKETS WITH BLOWING FAN.



INLET OR LEFT-HAND SIDE OF NAPIER SIX-CYLINDER WATER-COOLED MOTOR. CYLINDERS CAST IN PAIRS. NOTE ARRANGEMENT OF INLET PIPING TO EQUALIZE TRAVEL OF GAS TO ALL CYLINDERS.

of car, do not afford a striking contrast with detail constructions of this company.

The evolution of the Frayer-Miller six came about through a demand for a still faster and more powerful car of the same make as the well-known four-cylinder model, and the first complete machine was turned over to a purchaser last September. The car has had a thorough trying out and, with the exception of a few minor details, the regular model for this year is a counterpart.

The air-cooling system of the Frayer-Miller is too well understood to call for a detailed explanation, but the method may be briefly stated to consist of the jacketing of the cylinders, which are studded with integral cylindrical spines of small diameter, with thin aluminum castings, open at the bottom and communicating at the top with an air chute which conveys air from the blower at the front of the motor to the openings in the bottom of the chute communicating with the air jackets of the cylinders.

The connecting of the aluminum air jackets with the chute over the cylinders demands that the valves be actuated by outside mechanisms, and in this motor the location of the valves and push rods has been worked out to accomplish this end with neatness and simplicity of the various parts. Two camshafts are fitted with the inlets on the right side and the exhausts opposite, the piping from the carbureter being direct and so branched that gas travel is very nearly equal for all six cylinders. The exhaust is carried directly downward from each cylinder to a manifold of generous diameter and connections are so made that any cylinder may be entirely disconnected without disturbing the piping to the other cylinders.

Cylinder dimensions are the same as in the four-cylinder model, 4 1-16 by 5 1-8 inch and the horsepower rating is 36. Engine engagement with the drive is through the medium of a reversed cone, leather faced, with the plate perforated for free passage of the air thrown from the fan flywheel, which is provided for the removal of warm air from under the hood.

The change speed is obtained by a single lever working in a box quadrant, the changes being selective with the reverse pinion out of engagement except when the change speed lever is in reverse position. Final drive is through propeller shaft to the rear axle, with direct drive on fourth speed. Ignition is jump spark with storage batteries or magneto, the plugs being located in the cylinder heads, inside the air chute and accessible for inspection or replacement by means of removable plates over the cylinders.

The well-known Stevens-Duryea four-cylinder model is supplemented this year by a six-cylinder designed on similar lines. The "unit" power plant and three-point suspension for the same is retained in all details for the large car, the only material difference being the increase of dimensions necessary in the parts to care for the greater stress imposed by a higher power motor and the addition of two cylinders.

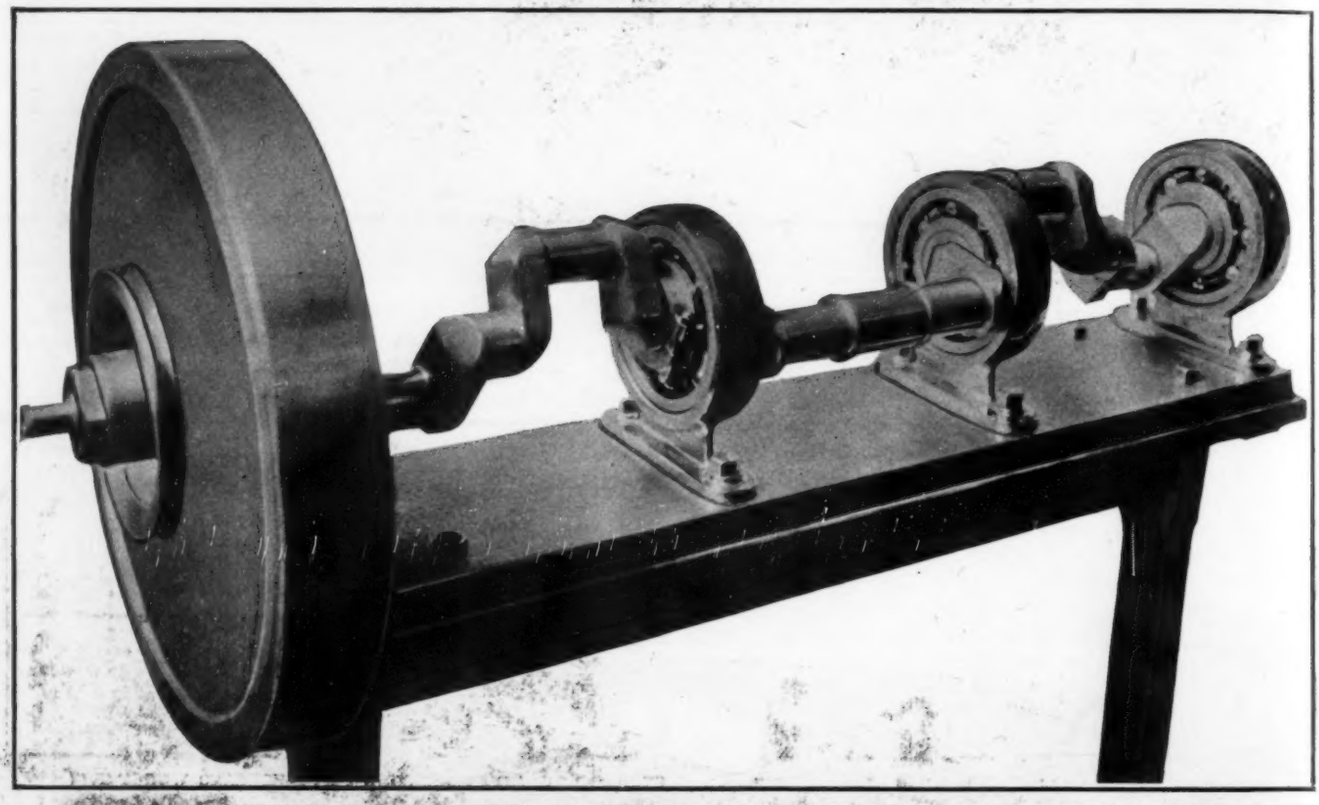
The crankshaft of the new six is an interesting example of high-class workmanship, and with its non-adjustable ball bearings is an assembly that should contribute to the efficiency of the motor.

The cylinders are individual castings, set very close, so that the total length of engine is kept within reasonable limits, and the same practice of valve disposition is followed as in the four-cylinder car, both inlet and exhaust being on the left side of the motor, side by side placement. Cylinder dimensions are 4 3-4 by 5 1-4 inches, with rating of 50 horsepower.

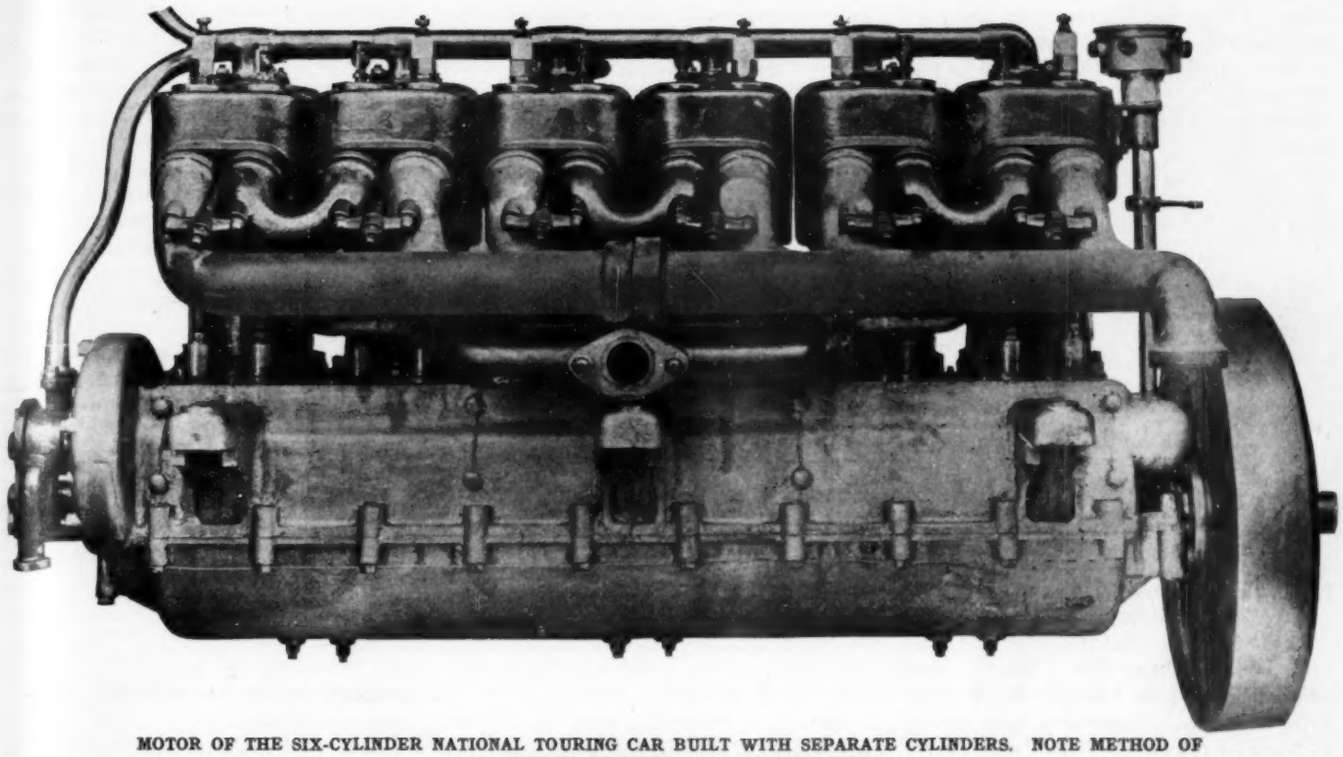
The inlet manifold is supplied from the carbureter by two pipes, one of small diameter, 3-8 inch, designed to furnish sufficient mixture for the motor when running throttled down to slow speed, and a larger induction pipe, 1 1-4 inches in diameter, which is fitted with automatic valves to open and supply mixture when the engine is speeded up with throttle open.

Lubrication is provided from a multiple force feed oiler and leads are fitted to lubricate all important bearings. The ignition is jump spark from storage cells with six coils on the dash.

The multiple disk clutch of the four-cylinder car is retained but extra plates have been added to insure positive drive of the more powerful motor. The combined motor, clutch and transmission case of the four-cylinder car is considerably strengthened, but the three-point suspension is unchanged, and the chassis presents



FIVE-THROW CRANKSHAFT OF STEVENS-DURYEA SIX-CYLINDER MOTOR WITH FLYWHEEL IN FRONT. NOTE BALL BEARINGS.

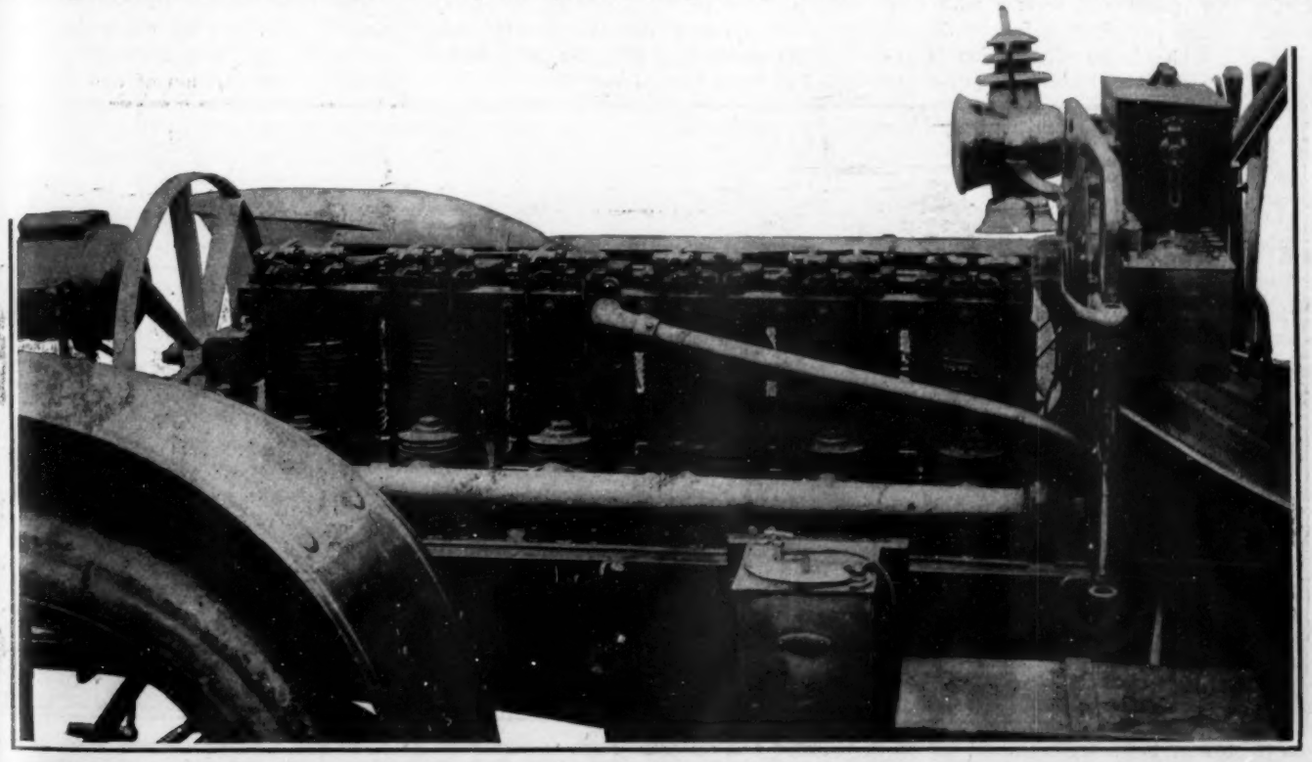


MOTOR OF THE SIX-CYLINDER NATIONAL TOURING CAR BUILT WITH SEPARATE CYLINDERS. NOTE METHOD OF ATTACHMENT OF INLET AND EXHAUST PIPES.

the same clean-cut appearance as the smaller model. The weight is stated to be 2,800 pounds, complete with body and full equipment.

That the six-cylinder car is believed to be a serious commercial proposition by the J. Stevens Arms & Tool Company is evidenced by the statement of a representative concerning the materials on hand and the estimate of the output of cars of this type, no less than 125 "sixes" being planned for the current year, with a vastly increased output for 1907.

One of the most sensational announcements of the past few months was the offering of the Ford Motor Company, of a six-cylinder car for $2,500. This car is an entirely new product, being widely different in many important details from the four-cylinder model manufactured by this company last year. In this new machine the cylinders are individual castings, jacket and valve chambers being integral. The valves are disposed conventionally on one side with actuation from a single camshaft. but located on the right side of the motor instead of the left which is the usual place-



LEFT-HAND SIDE OF FRANKLIN SIX-CYLINDER AIR-COOLED MOTOR WITH FORE-AND-AFT CYLINDER ARRANGEMENT. NOTE AUXILIARY EXHAUST CONNECTION AT BOTTOM OF EACH CYLINDER. HOOD AND FRONT ARE REMOVED.

ment. The cylinder dimensions are 4 1-2 by 4 1-4 and the rating is 40 horsepower. A special Holley carbureter is used to supply mixture through a simple and direct induction pipe of large diameter. The exhaust manifold is placed under the inlet piping and is attached to the motor by means of the same six bridges and studs as hold the induction pipe.

The valve chamber is closed at the top by recessed screw plugs, one over each valve, and the spark plugs are located at the apex of a triangle formed by the two plugs and the plug opening. This carries the points of the plug well towards the compression space and out from the valve chamber. The current is supplied from a Holley low tension magneto gear driven off the camshaft actuating gear, with battery for starting and emergency use.

The flywheel is cast with fan-blade spokes and the water circulation is by means of a geared pump, easily detached for repairs or adjustment.

The inlet and exhaust valves and push rods are interchangeable, a neat method of holding the push rod guides in position being employed. These push rods instead of being of cylindrical section as usual are 1-2 by 1 inch with perfectly square corners and have large bearings surfaces in the guides. The guides are held against the camshaft case by means of H-shaped yokes which rest on flanges at the base of the guides. The yokes are secured in position by a single hexagon nut drawn down on a stud which extends upward between each pair of guides.

The Ford planetary transmission is used, giving two speeds and reverse with final drive through propeller shaft and divided rear axle. The frame construction is unusual, but with the body in position appears conventional. Instead of using cross-members or a sub-frame the side members are brought well together and the motor and transmission supported from arms cast integrally with the cases. In the front spring suspension the springs are outside of the frame, the front horns being cranked outwardly to carry the springs away from frame interference when the springs are under compression and also to provide spring seats nearer the ends of the drop forged front axle. The rear springs, which are full elliptics, are carried on the frame from trunnions which, with the Ford triangular strut construction, take care of the driving and braking strains on the rear axle.

Control is through side lever for first and second speeds with reverse by foot lever. Emergency brake is fitted to the driving shaft with foot control and lever controlled service brakes to the rear wheel hubs.

The output of the factory is claimed to be 1,000 six-cylinder cars which should give this type of motor a thorough tryout during the current year.

The six-cylinder National of the National Motor Vehicle Company is an amplification of the four-cylinder model, very few material changes having been made in the make-up of the car, except, of course, the addition of two cylinders and the uniform increase of the size of parts to care for the added work they are called on to perform with increased power and capacity of the vehicle.

This car is described elsewhere in this issue of THE AUTOMOBILE and a brief mention in this article will suffice. The motor is a six-cylinder Rutenber engine with cylinder dimensions of 4 1-2 by 5 inches, rated at 50-60 horsepower.

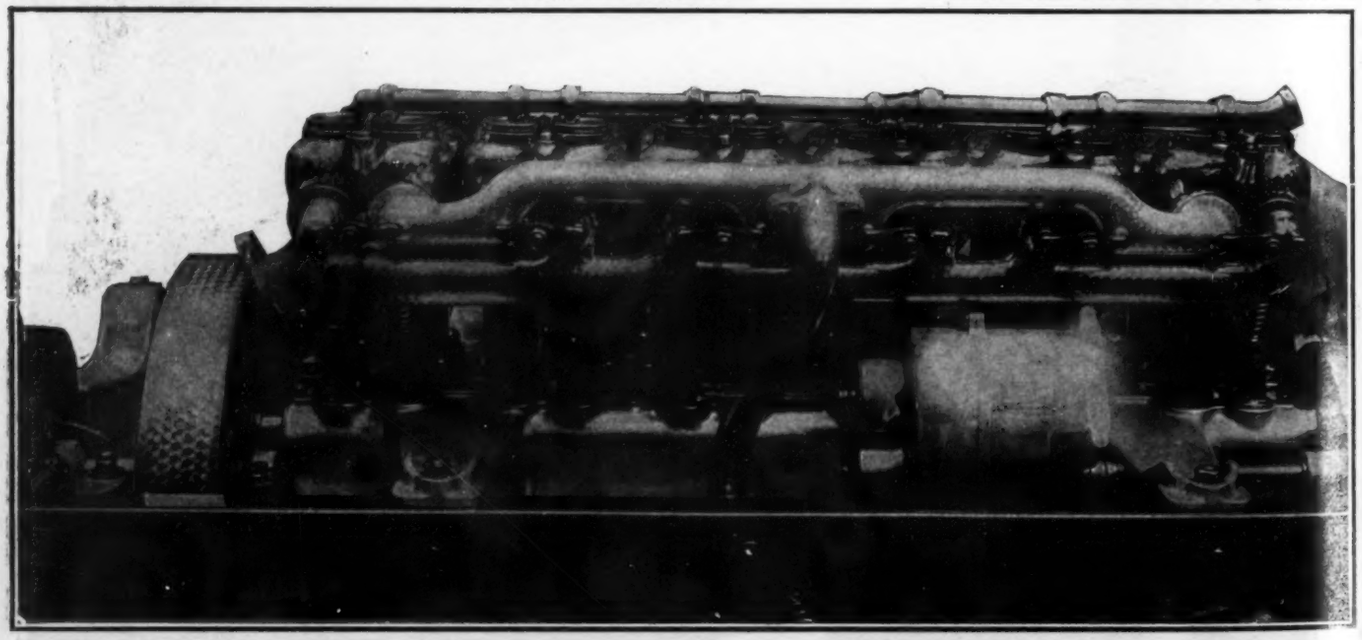
Inlet and exhaust valves are symmetrical and disposed side by side on the left side of the motor. The single camshaft fitted is of large proportions for the work and the only supplemental gears are for driving the pump and a small set of bevels for actuation of the vertical shaft at the rear of the motor carrying the timer and governor, which controls the engine by retardation of the spark. An engine governor is also fitted to cut down the engine speed when declutching.

Ignition is by jump spark from two sets of storage batteries which are kept fully charged by means of an Apple dynamo vertically located at the base of the dash with beveled pulley drive from the beveled rim of the flywheel.

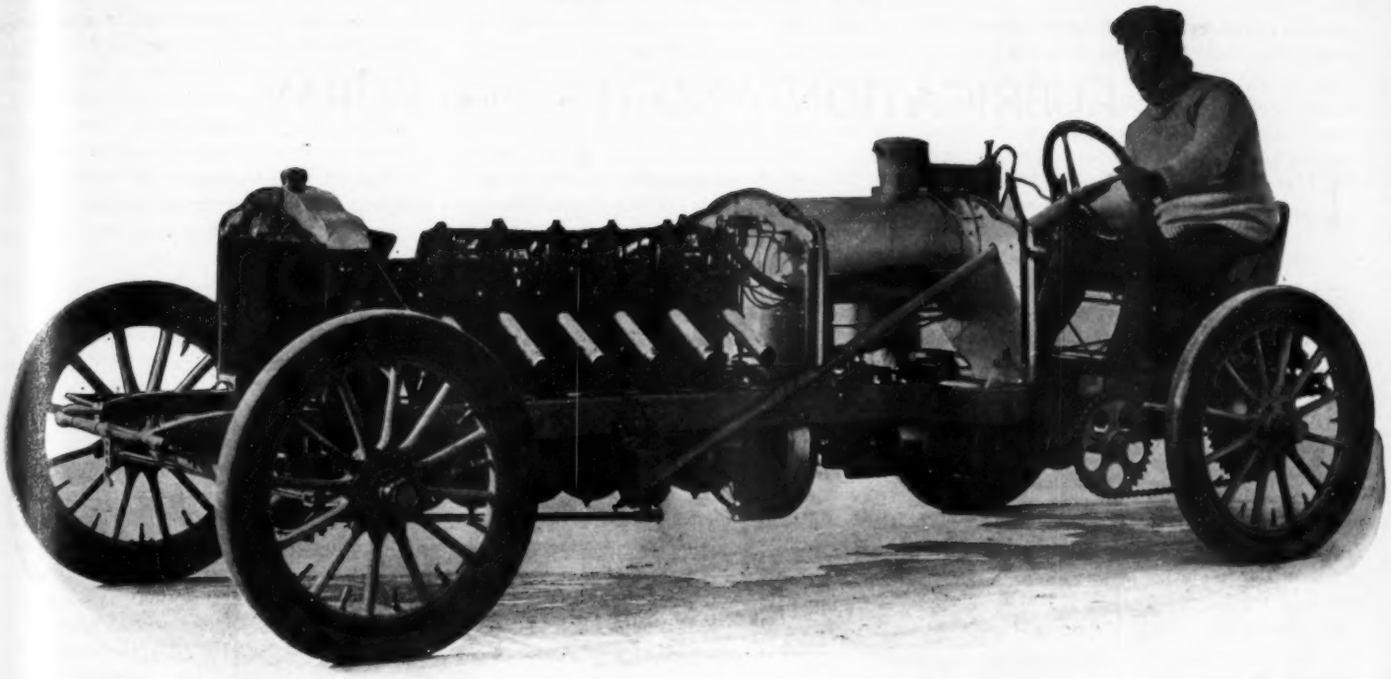
An ingenious gasoline feed is used consisting of a small tank located above the carbureter in such a position that the grade or position of the car will at no time bring the carbureter above the auxiliary tank. This small tank is supplied from the main tank under the seat by gravity, the feed pipe extending well toward the top on the inside. A vent pipe with capped end terminates on the dash.

This car is offered as a regular model and is in no sense an experimental venture, deliveries being guaranteed and demonstrations to probable purchasers being made daily during the shows. A ride in the car reveals many of the possibilities of this type of motor, and among other noticeable features the great reserve of power and flexibility of engine control promise well for the survival of the six-cylinder automobile as a standard model.

The sixth of the six-cylinder cars on view at the shows, the Franklin, is another car of this type in which the main changes consist of the addition of two cylinders to



VALVE SIDE OF FORD SIX-CYLINDER MOTOR IN TOURING CAR CHASSIS. NOTE LOCATION OF MAGNETO FOR IGNITION SYSTEM, ALSO METHOD OF CLAMPING INLET AND EXHAUST PIPES IN PLACE.



THOMAS SIX-CYLINDER CHAIN-DRIVEN SPECIAL RACING CAR INTENDED FOR FLORIDA RACES.—FRANK COEY AT THE WHEEL.

the regular four-cylinder motor. The dimensions of the cylinders are 4 by 4 inches and the rating is 30 horsepower. Change speed is sliding gear with three forward speeds and reverse, third being direct drive to the rear divided axle by means of square section propeller shaft.

The new Franklin disk clutch contained in the hollow hub of the flywheel is used for engagement of the drive and in this model cooling is assisted by both a flywheel fan and a gear-driven aluminum fan of large diameter at the front of the motor. The typical Franklin radiating flanges are used on the cylinders, also the supplementary exhaust and the other details of motor construction found in this company's product.

The inlet and both exhaust pipes are particularly straight and simple of removal. Accessibility of parts has been given more attention than in the earlier practice of the company and as a result the Franklin six is no more difficult to tune up than an average car of four-cylinders.

The four springs are full elliptics and the wood frame construction is continued. The car on the road controls by throttle and spark quite as well as a steamer and may be slowed down to a crawl on high speed or jumped into a stride without the slightest choking of the motor.

The E. R. Thomas Motor Company has produced a highly specialized six-cylinder car which has not been offered as a regular touring model but which may be said to have been produced in a strictly commercial way, as it has been sold and offered as a model built on order. The motor is closely patterned after the standard four-cylinder engine found in the standard Thomas chassis and in a number of instances has demonstrated its speed and reliability when pitted against cars of the highest power and great cost.

The illustration herewith shows the six-cylinder Thomas stripped for road or track racing, and the position of the driver well over the rear wheels should be noted, also the location of the gasoline tank in such a position that a good head is provided at the carbureter. It was not on view at the shows.

With these half-dozen six-cylinder stock cars in the market this year, and in considerable quantities, the type will have a thorough test before the next annual automobile shows and if the proof is as favorable as the promise it is not improbable that a considerable number of the prominent manufacturers of the United States will add a six to the regular line of standardized four-cylinder models now being turned out.

BOSTON SHOW IN TWO HALLS

Management Engages Symphony Hall to Supplement Mechanics Building.

BOSTON, Jan. 29.—Applications for space continue to pour in for the Boston Automobile and Power Boat Show which is to open six weeks from this evening, and the show committee and Manager C. I. Campbell are almost at a loss for space. Mechanics Building was all allotted some weeks ago, when it was hoped that everybody who desired to exhibit had been accommodated, but Mr. Campbell made a trip to New York and found that there were a number of exhibitors there who wished to show in Boston. He therefore engaged Symphony Hall, where the importer's show was held last year. Although he has had the space plans for this building on exhibition only about a week, nearly all the floor space has been taken by exhibitors of machines. Only admission price is to be charged for both shows, and a coupon ticket will be issued so that the visitor can see the entire automobile exhibition with the purchase of one ticket.

It is promised that the Boston show will as usual have many new things in automobiles on exhibition. Several cars which were not ready for the New York shows will be shown here from March 10 to 17, and the two months intervening between the New York and the Boston shows will give the manufacturers an opportunity to make ready a more complete display of their 1906 offerings.

The Boston show committee has not yet announced its decorative scheme, but it is known to be planning something which will rival the elaborate transformation of Madison Square Garden. Mechanics Building and Symphony Hall are to be treated differently, a color scheme being used in Symphony Hall which will be a decided contrast from that in Mechanics building.

If automobiles were, as a rule, given half the attention that the locomotive engine receives there would be far less complaint regarding mechanical troubles.

This is a true story. A man who hated to run slowly recently made a trip of thirteen miles, running most of the way at the rate of thirty or forty miles an hour. It took him an hour and a half to reach his destination, however, for on the way he started a runaway, was stopped and lectured by a policeman, and finally ditched a wandering cow, mussing up his tubular radiator in a most disagreeable way.

LUBRICATION AND ITS 1906 FORMS.

THERE are so many parts in an automobile, the proper functions of which are a prime necessity for the satisfactory operation of the machine, that the most important one cannot be named. One provision, however, which it is not only essential to establish for an automobile, but for every mechanism with parts of relative motion, is the lubrication. Materials, of which parts for a mechanism can be formed, have such charcteristics that they rub particles of the contacting surfaces of relative sliding motion at such a rate that the necessary form of such surfaces is soon destroyed, thereby preventing the different parts from properly performing their functions. It is therefore necessary to prevent the sliding or rubbing contact of such surfaces by the interposition of a medium of different characteristics (lubricant) or by purely mechanical means.

The latter consists of roller or ball bearings which form of contact for surfaces of relative motion produces a very slight wearing effect that can be practically neglected if pure rolling contact is achieved—so far as correct design and smoothness of rolling surfaces permit. Where, for different (frequently commercial) reasons, such a construction is not employed, so called "lubricants" are placed between the rubbing surfaces, and it is the theory that the "globules" of the lubricants perform the same functions as the metallic rolling elements in the ball or roller bearings. As it is an established custom to either use oil, grease, or graphite, separately or in combination for rubbing metal surfaces, this practice has naturally also been adopted for automobile practice.

The constructive elements composing an automobile vary in their working conditions to such an extent as to call for lubricating means of different characteristics. Disregarding entirely roller and ball bearings, and for the present considering oils and grease only, it is necessary to establish the lubricating conditions for the different parts.

The material composing the mechanical elements of rubbing contact in an automobile is chiefly metal; iron steel, bronze, brass or copper specifically—and in minor use fiber, rawhide, leather or compositions of similar character. Where metals only come into consideration "machine-oil" should be the best means of lubrication. But to determine if oil or grease should be used and what grade of any one of them, again depends on a multitude of considerations, which cannot always be thought of from a point of view of efficient lubrication only, and which include detail form of surfaces, contact working pressure, lubricating system or means to assure the presence of the lubricant at the point wanted, and even the effect of the lubricant upon the noise of the mechanism while in motion.

This last consideration might be dealt with at once as it is often an erroneous one. Taking as an example the bevel gear drive on the rear axle of a shaft-driven car, the housing of which is very often "packed with grease." The reason for using grease instead of oil is usually found in the construction of the gear housing which would not retain a thinner lubricant, or in other words because the case is not oil-tight. Another reason often cited is that heavy grease makes the gears work silently, which, although a fact, is an apology for inexact design or workmanship, or both, creating the objectionable noise. A valuable practical feature of this method, however, is its simplicity, and the great length of time for which one "packing" secures reliable lubrication.

Where vulcanized fiber and similar compositions are used either alone or in combination with metals, oil or grease can be used for lubricating the moving parts. Leather especially, as used for clutch facing, is best lubricated with castor oil, judiciously applied. It is natural that the most unsatisfactory lubricating conditions exist, when two elements of radically different material call for simultaneous lubrication.

VIEW OF DASH OF 1906 PREMIER AIR-COOLED CAR SHOWING OIL SIGHT FEEDS IN POSITION. MECHANICAL OILER IS LOCATED UNDER THE TOE BOARD.

The second main condition (working speed), calls for lighter lubricants with higher speed, whereas the third condition (temperature) demands heavier lubricants for higher temperature.

This last condition is naturally of decisive character for motor lubrication and would create an almost impossible situation considering different parts of a motor, if it were not for the fact that a lubricant suitable for work under highest temperature (lubricating the cylinder walls) is also satisfactory for the other parts of the motor. The superiority of "cylinder oil" as a lubricant and the desire for centralization of supply and uniformity of material have caused many to use it all over the car despite its high price.

Before entering on a comparison of existing oiling systems, it is well to mention that even for the lubrication of metals alone the derivation of oils is of great importance. the main condition being that they must be free from acid, or without corrosive influence. For cylinder lubrication animal and vegetable oils are impossible on account of the contained acids in the one case, and the conversion into tarry substances in the other. Pure mineral oils are therefore preferable, as they are free from these serious defects, though oil sold as pure mineral is frequently adulterated with organic oils to increase its viscosity.

Assuming that a suitable lubricant or oil

has been determined upon for a certain motor and for other parts of an automobile. Each part or constructive group may be lubricated independently or a centralized system may be worked out as far as practical considerations permit. But whatever the general plan may be, the lubrication can be accomplished in two ways only: First, to provide enough of the lubricant at the desired point to last for an extended period of time without replenishing (permanent lubrication); or, second, to feed the lubricant as needed to this point under pressure from a reservoir (periodical lubrication).

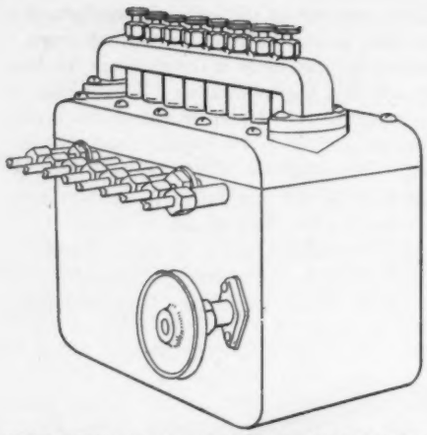
This year's New York shows presented in the exhibits of complete cars, oilers of almost every possible combination of functions cited. The reasons for these wide differences of opinion and practice are not easy of explanation except that the whole question of lubrication is one not fully investigated and solved for the automobile.

With the exception of one or two cars of foreign make, in which thin lubricating oil is fed from a central point, not only to the motor, but also to the transmission case, rear axles, pumps, steering column and universal joints, the general practice is to feed lubricating oil from a central reservoir to the motor alone or in fewer cases to the motor and transmission case and to lubricate all other working parts independently by oil or grease cups or other individuol means.

An exception to this practice, which, however, is represented by several makes of good reputation, is the splash system pure and simple. Motors oiled only by splash system have provision for the maintenance of a constant oil level in the crankcase which produces more or less satisfactory results. The simplest system consists in the filling of the crankcase with oil to a predetermined height; cross partitions in the lower crankcase maintain a sufficient amount of oil for each crankpin dip. A hand pump is fitted to take oil from a reservoir, and force it through one to four leads, into the crankcase. This pump is operated by the driver whenever he thinks that an additional oil supply seems advisable. The efficiency of this system depends entirely on the judgment of the operator, which may not be considered ideal.

In a modified form of this system in several makes, an automatic supply to the crankcase from a reservoir is provided for,

LOOKING FROM REAR TOWARD DASH OF 1906 PEERLESS TOURING CAR CHASSIS. NOTE MECHANICAL OILER WITH GAUGE GLASS ABOVE AND TO LEFT OF FLYWHEEL AND ROW OF SIGHT FEEDS ON DASH DIRECTLY IN FRONT OF DRIVER.



REAR VIEW OF A MECHANICAL OILER SHOWING PULLEY FOR BELT FROM MOTOR, ROW OF UNIONS FOR FEED PIPES AND BACK OF SIGHT FEEDS ON TOP.

which supply, once properly adjusted, maintains the effective working of the splash system as long as the reservoir contains oil, and this without any attention from the driver.

A more usual method of increasing the reliability of supply is connection of the oil tank with the exhaust passages, so as to maintain by arrangement of automatic check valves a more or less constant pressure upon the oil, which is thereby forced to the sight feeds, from which it descends by its own weight into the crankcase. The exhaust pressure being small, and the influence of gravity still less, great care is needed to maintain unobstructed passages. The pipes may easily be diminished in their free opening, either by deposits introduced by the exhaust gases or by deposits of oil on the walls.

This system calls for special attention to maintain an even fluidity of the oil. This is secured by keeping the reservoir at a constant temperature. Usually the main tank, or sometimes an auxiliary tank, is placed under the bonnet, above the exhaust pipe, or above the motor, or even between the cylinders. Such arrangements have a decidedly beneficial influence upon the regularity of oil supply with any exhaust or crankcase pressure system.

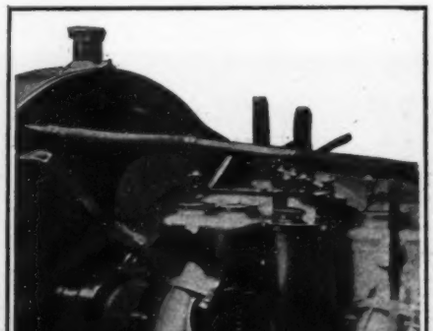
Another system now very largely adopted is to supply oil by mechanical means—usually in the form of pumping elements actuated by the motor itself. This, if properly designed, makes the transfer of the oil from tank to sight feed or direct to the crankcase or places of contact as positive as at present obtainable. The increase of motor speed naturally increases the oil supply in direct proportion, which does not necessarily follow with any gravity system, in which the adjustment is usually made for an average motor speed to maintain satisfactory conditions of lubrication.

The different forms of mechanical oilers show a more or less perfect arrangement for the positive distribution of the oil, one construction going so far as to take into consideration the possibility of passage deposits or obstructions. In this system the oil is not subject to a pump action pure and simple, but is projected through the piping by a sudden impulse—imparting high inertia to the oil, which may be considered an advantage.

An inspection of the cars at the shows gives an impression of a considerable amount of care taken by manufacturers of pressure oilers in detail construction, though a special discussion of such details would far exceed the scope of this study.

The readiness of the manufacturer of oilers to shape his product according to the special wishes of the automobile designer indicates the agreeable conditions which exist between the car builder and the manufacturer of accessories and parts, which are improving from season to season, forming one of the most influential causes for the rapid and uniform development of the automobile industry.

The statistics of this year's shows manifest, without a doubt, the tendency of American automobile builders to use mechanical force feed oilers of the best obtainable type and it is rather surprising to compare the ratio of cost of oilers to car price, as some automobiles, interesting on account of their low price, are equipped with the most improved type of lubricators.



LOCATION OF VERTICAL OIL TANK BETWEEN CYLINDERS OF MOTOR ON PACKARD CAR.

The employment of the good qualities of such oilers for motor lubrication is quite different with different makes. Outside the previously discussed splash system pure and simple special arrangements for the independent oiling of the cylinders by either one or two feeds for each cylinder seem to gain favor.

Provision is also made to alter the rather uncontrollable action of the splash system, regarding certain motor parts (outside the cylinder walls), to insure positive oiling. This is done for the crankshaft bearings by ring and chain oilers, perforation of bearing caps, scoops of different forms, arrangement of oil-retaining felt pads on the sides of the bearings, oil grooves of all kinds and shapes inside the bearings, and even oil pockets in the bearing surfaces.

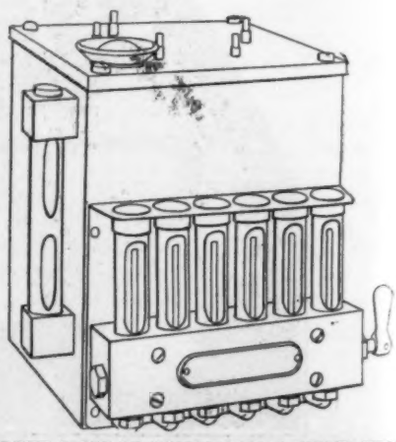
Straining devices for the oil to insure its freedom from particles of foreign matter are also coming into apearance.

The utilization of pump and spray systems points to the desire to maintain an abundant oil supply for all wearing surfaces, with a rapid circulation of the oil to the extreme permitted by cylinder and piston ring construction.

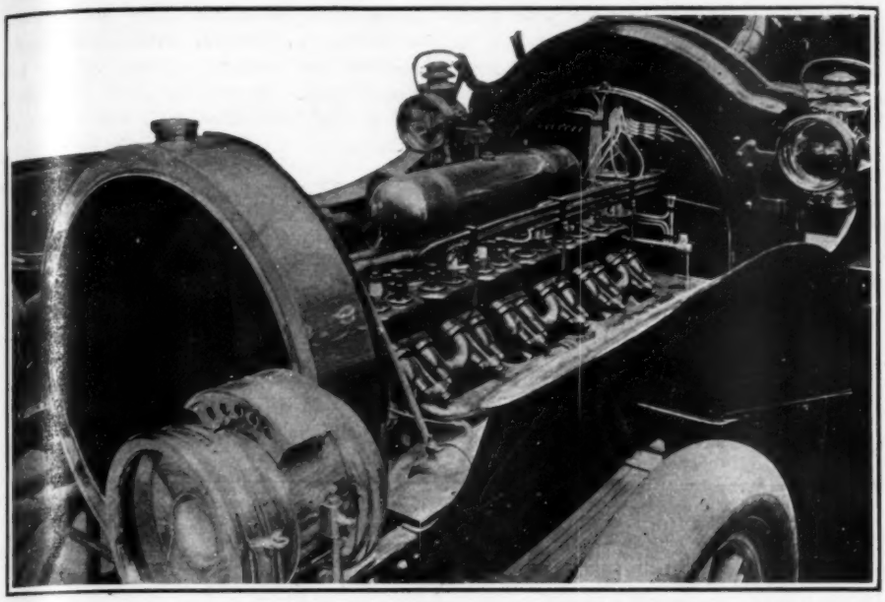
One form shows the employment of a screen arrangement above the crankcase (horizontal motor) for the apparent purpose of increase of the oil surface in contact with cool air, to use the oil not only as a lubricant, but also as an internal means of motor cooling. Wherever internal motor cooling is not disadvantageous to motor efficiency it must be considered beneficial from a point of view of lubricating efficiency, as the lowering of the temperature of rubbing surfaces is a direct supporter of lubrication.

Where the splash system is deemed uncertain in its action or considered as likely to occasion carbonization inside the cylinder by possible overoiling, the direct internal oiling of bearings is adopted in more or less complete form. Oil is driven through the entire length of the crankshaft, from end bearing to end bearing, a hollow crankshaft being used in connection with hollow connecting rods. Through these passages a rotary pump maintains the rapid circulation of an abundant supply of oil. This is strained at one convenient point of its recurrent passage. Special provision is made for oiling the cylinder walls. The system is a closed one, the oil circulating continuously from the reservoir through the pumps and piping to the motor and the unused quantity being returned to the reservoir —while the motor is running.

It is probably the immediately apparent difference in motor action as between imperfect lubrication and complete lubrication which leads to such empirical development of motor lubrication. Other parts of a chassis are, as usual, oiled by the grease packing



FRONT VIEW OF A MECHANICAL OILER SHOWING FILLING CAP, GAUGE GLASS FOR PUMP CHAMBER AND SIX LIGHT FEEDS.



MOTOR OF NATIONAL TOURING CAR WITH HORIZONTAL TUBULAR ROUNDED END OIL TANK SUPPORTED ABOVE CYLINDERS.

or oil-bath system, or by the use of grease or oil cups, which, however, call for judicious handling. The only part receiving more attention lately is the transmission. On many makes it has been included in the more reliable sphere of action of the motor lubrication.

The greatest hindrance to the harmonious development of a uniform oiling system lies in the fact that it would call for a rather complicated arrangement, and that separation of the fresh oil supply from oil that has been "used up," "lost its body," or, generally speaking, has lost its lubricating qualities, is so far an unsolved problem.

The methods of transferring (feeding) the oil from the original source of supply to the parts to be lubricated, may now be considered. The simplest method is by gravity alone without the aid of any additional pressure, either mechanically applied or by the use of exhaust or crankcase gas pressure. This method was formerly used much more extensively than now and comparatively few cars at the show were so equipped. The principal objection raised to this system was the necessity for frequent readjustment of the supply valves to maintain a rate of feed proportioned to the varying speed of the engine when touring. A few makers of long experience, however, have worked out gravity systems in so thorough a manner for their cars that apparently they do not find any necessity to change to a pressure system.

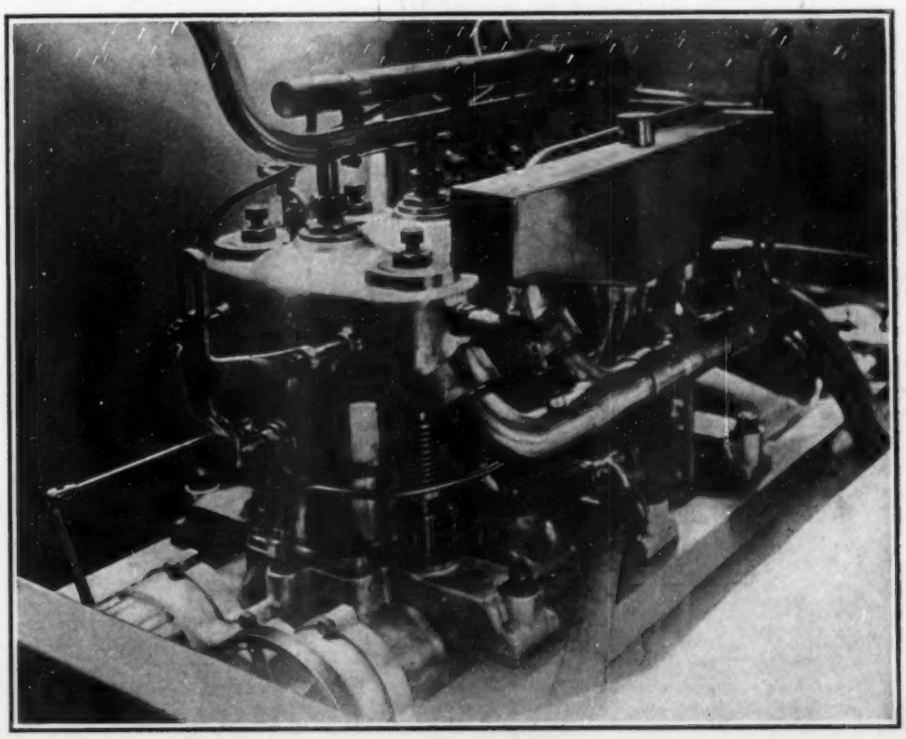
Another system which is employed by a few makers chiefly for small cars fitted with horizontal motors, is the use of the crankcase pressure to force the oil from the tank to the crank base and other points to be lubricated. In the pipe connection leading from the crankcase to the oil tank, a check valve is necessarily fitted; this valve permits connection between the crankcase and the oil tank when the pressure in the former exceeds that in the latter or, in other words, when the pressure impulses occur in the case.

A good example of gravity feed for lubricating the motor is found in the Pierce Arrow. In this system an oil tank is arranged above the cylinders, under the hood, to insure even temperature of the oil, the bottom being inclined to the point of oil exit to secure a supply at any inclination of the car. Three leads of ample dimensions permit of a continuous and liberal flow of oil from the tank to the three crankshaft bearings. The crankshaft being drilled for passage from each crankshaft bearing to the adjacent crankpin bearings, the oil passes from the crankshaft bearings by centrifugal force to the crankpin bearings, from which it issues in a spray filling the whole interior of the motor with oil. The oil then collects at the bottom of the crankcase in a specially formed depression from whence it is lifted again by a centrifugal pump to the oil tank under the hood. Wire gauze filters are provided at the bottom of the oil tank and on top of the oil collecting chamber in the crankcase.

An example of the splash system pure and simple, with gravity feed, is found in the motor lubrication of the Northern car, which attracted so much attention at the Madison Square Garden Show on account of its many novel features or old principles in novel combinations.

The lubrication is of the simplest form possible. The principle is similar to that formerly used on Franklin cars, and consists practically of an oil tank arranged alongside the crankcase with a passage between. The oil flows through this passage until a pre-determined level is reached in the crankcase compartments, to maintain a standard efficiency for the splash lubrication.

Whereas an automatic syphon arrangement was used in the Franklin cars, in the Northern two-cork floats are used, which shut off the oil flow to the main fore and aft crankcase compartments when the proper level is reached. These automatic float valves permit of exact regulation after one setting and so the whole system is a continuous one. A "sight" in the tank permits inspection of the quantity of oil, and



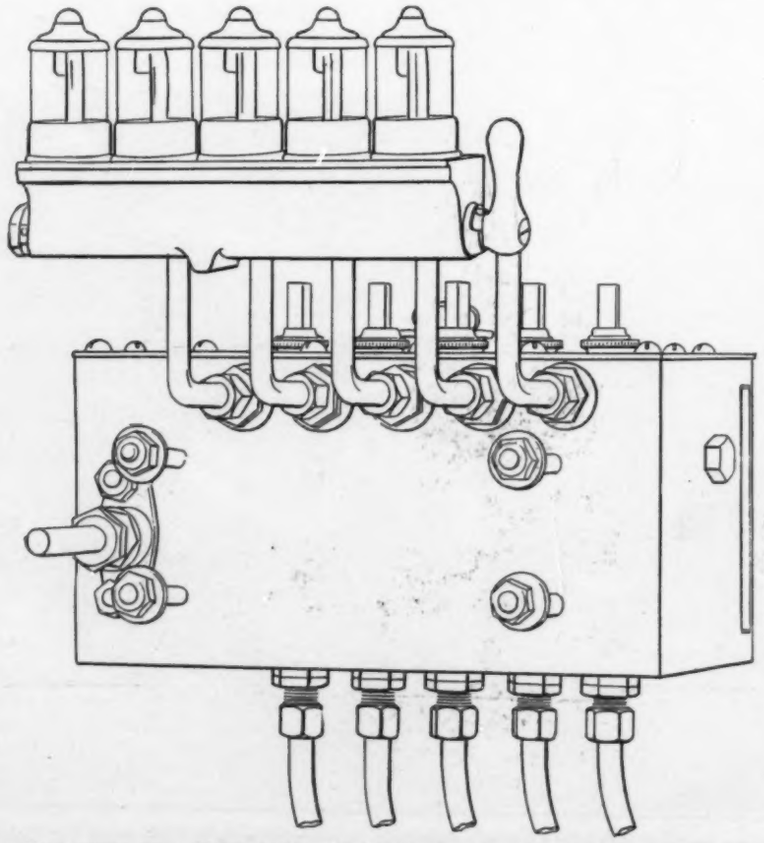
MOTOR OF PIERCE "GREAT ARROW" TOURING CAR SHOWING RECTANGULAR OIL TANK WITH INCLINED BOTTOM LOCATED ABOVE EXHAUST PIPE TO KEEP OIL AT UNIFORM TEMPERATURE WHEN CAR IS IN USE.

a refilling of the supply at rather long intervals is all the attention demanded by this construction. When the level determining valves are properly set, gravity maintains an unvarying quantity of oil in the crankcase.

Lubricating under exhaust pressure which in its best known form is the standard of Mercedes construction, has found application in several American cars. The Waltham (Orient) car may be given as an exponent of the simplest arrangement. The location of an oil tank under the hood near the engine maintains nearly constant temperature of the oil. A pipe leads from the exhaust pipe to the top of the tank with an interposed ball valve check, thereby maintaining pressure in the tank when the motor is running which forces the oil to adjustable sight feeds on the dash, from whence the oil descends under gravity to the parts to be lubricated.

A typical example of prevalent mechanical pressure lubrication methods is that shown on the Frayer-Miller car. A Hill oiler is fitted under the hood near to the engine so as to maintain the oil at constant temperature, and therefore fluidity, irrespective of fluctuations of temperature of the air. This oiler forces the oil through the feed pipes. Four feeds supply centrifugal ring oilers which assure the lubrication of the four crank pins. Leaving these bearings the oil sinks to the bottom of the crankcase, forming the supply of the splash system, which lubricates all the other parts of the motor. One feed carries oils to the blowing fan bearing, and three feeds supply the transmission case directly.

The accompanying engravings illustrate some of the points touched upon and show also typical forms of mechanical lubricators which are generally carried on the dash, either in front of the driver or under the hood. In the latter case, the lubricator is frequently connected with a row of sight feeds showing the driver at a glance whether or not the oil is flowing in each of the feed pipes.



FRONT VIEW OF A MECHANICAL OILER SHOWING SPECIAL ARRANGEMENT OF SIGHT FEEDS AND OIL LEADS.

European Circuit Route.

PARIS, Jan. 12.—The long-distance endurance test proposed by the Marquis de Dion and organized by the Automobile Club of France will be over the following route: Toulouse, Aix-les-Bains (Savoy), Milan, Innsbruck, Vienna, Prague, Berlin, Cologne, Liège, Reims and Paris. The daily stages of the European Circuit, as it is called, will not exceed 220 miles on the easy portions of the route and 125 miles in mountainous districts. These limits are necessary owing to the presence of many cars of small power in the competition. Indeed, in the crossing of the Alps the high power touring cars will be sufficiently tested by the distances imposed.

The tour will probably be held in June. On January 20 an international meeting of delegates of automobile clubs will be held at Berlin, to consider details and finally approve the program drawn up by the French club. Marquis de Dion, as promoter of the endurance test, will represent France.

Thery to Build Cars.

PARIS, Jan. 18.—Leon Théry, winner of the Gordon Bennett Cup in 1904 and 1905, is about to leave the Richard Brasier firm and will found a business to construct automobiles bearing his name. Only a few years ago Théry was in a very humble position as an adjuster, earning less than $2 a day, but as the result of his four successive victories in the eliminating and final races for the Gordon Bennett cup, he earned quite a fortune.

After his victory on the Auvergne circuit last year, Théry received hundreds of offers of various kinds, all of them of an enticing nature, but to all of them he gave a refusal, declaring that he had abandoned racing for ever, and that in future he would continue in his own quiet sphere at the Brasier factory. Up to the present, indeed, Théry has allowed his newly-acquired fortune to change none of his habits. He is still an under-foreman at the Brasier factory and still occupies, with his wife, a modest flat in a workingmen's quarter of Paris.

In the new venture he will be joined by financiers with large capital at their disposal, but the machines will be constructed under the name of Théry, who will be at the head of the concern. Caillois and Stead, Théry's companion drivers, have both cancelled their engagement with the Brasier firm, and it is very probable that Caillois will this year drive a Hotchkiss racer.

To meet the demand created by the large number of persons constantly on the lookout for suitable locations for manufacturing sites, the Massachusetts Bureau of Statistics of Labor has prepared a book entitled "Industrial Opportunities Not Yet Utilized in Massachusetts." The work has been prepared with much care by Charles F. Pidgin, chief of the bureau, assisted by Frank H. Drown and William G. Grundy. After a short introductory, explaining the object of the book and the reasons for its preparation, characteristics of the various towns are taken up in alphabetical order. The population of each place is given, with the railroad connections, and a short but comprehensive summary of the interests and productive possibilities of each place. This information is contained in about three hundred pages, and is supplemented by a tabulated list of the workshops throughout the state which are at present idle, giving the number in each town, and the business last carried on in each; also other tabulated information of great value to persons interested in the subject, and which it is often very difficult to procure. The work is worthy of careful perusal.

ANALYSES OF AMERICAN MOTORS.

THE tendencies in American motor designing and construction can probably be better observed through a careful canvass and tabulation of details as seen at the New York shows than by simply walking about and getting a bird's eye view, so to speak. Everyone will undoubtedly admit that the most remarkable feature of the shows was the number of cars fitted with four-cylinder motors. A careful study of the 150 American-built cars shows that 68 per cent. had motors of this type, while the one-, two- and three-cylinder types had only 5, 20 and 2 per cent., respectively, and the six-cylinder, a newcomer in the field, was used in one car in every twenty-five.

These percentages would seem to indicate the ultimate disappearance of the single- and triple-cylinder motors and the survival of the double-cylinder only in the opposed form, as a careful study of its 20 per cent. reveals the fact that already 90 per cent. of these are double opposed.

Considering the figures from the standpoint of vertical, horizontal or inclined motors, the vertical has a percentage of 76 against 22 per cent. for the horizontal and only 2 per cent. for the inclined cylinder. The percentage of the horizontal motors placed under the bonnet is also on the increase, and fully 50 per cent. of the double-opposed type is so used.

Considering the motor question from the cooling standpoint, the figures show that 83 1-3 per cent. of all the American motors shown are water cooled; but this is hardly a just comparison, as the figures also show that the large motor is in the majority, and these are nearly all water cooled, while among the smaller sizes the relative number of air-cooled motors is greater.

Taking the details of the motors themselves and the features of construction, the separate cylinder is used on 70 per cent. of the motors, while casting in pairs is found on 26 per cent. and one casting for all cylinders on only 4 per cent. The dual casting is practically confined to the higher-priced cars, and as these are in a minority the percentage is naturally small.

The question of the proper location for the valves is one which is still unsettled, as is shown by the percentages. Valves located on one side of the cylinder only and operated by the same camshaft are used on 26 per cent. of the motors. Valves on opposite sides of the head operated by two camshafts are used on 21 per cent. of the motors. Valves directly in the head are used on 20 per cent. of the motors, while valves placed in odd positions, such as, for instance, the inlet in the top of the cylinders with the exhaust in a pocket on one side, or *vice versa*, together with the indiscriminate location of valves in horizontal motors, the percentage of which it is difficult to ascertain, are used on 32 per cent. of the motors. The greatest increase is undoubtedly in the use of valves directly in the head. This percentage is largely made up in the air-cooled class, in which the practice is almost universal. The automatic inlet has almost disappeared. It has a percentage of only .05.

The type of ignition used on the motors is the subject of much diversity of opinion, although the jump spark with multiple coil leads with a percentage of .81, followed by

American Cars Selling at $400 to $1,000 Inclusive.

Name	Price	No. of cyls.	Position of cyls.	Cyls. cast	Cooled by	Bore & stroke, ins.	R.P.M.	Rated H.P.	Valves Located	Ignition	Lubrication	Circulation	Carbureter
Autocar	$1,000	2	horizontal	separate	water. . .	4 x 4	1000	12	inl. over ex. . . .	jump spark	auto and splash.	. . . . .	not governed.
Buick	1,000	2	horizontal	separate	water . . .	5 x 4½	1100	22	inl. over ex. . . .	jump spark	mechanical.	gear pump. . . .	not governed.
Cadillac	750 / 950	1	horizontal	separate	water. . .	5 x 5	650	10	vert. in head. . .	jump spark	mechanical.	gear pump.	not governed.
Crawford	850	2	vertical. . . .	separate	water. . .	4 x 4	1200	16	inl. over ex. . . .	jump spark	pressure.	cent. pump. . . .	not governed.
Ford	500	4	vertical. . . .	pairs. . . .	water. . .	3⅜ x 3¾	1400	15	side by side. . . .	jump spark	mechanical	gear pump.	not governed.
Ford	1,000	2	horizontal	separate	water. . .	4½ x 4	1000	12	hor. side by side	jump spark	pressure.	gear pump.	not governed
Glide	800	1	horizontal	separate	water. . .	5 x 6	650	9	hor. side by side	jump spark	gravity.	gear pump.	not governed.
Logan	900	2	horizontal	separate	air.	4 1/16 x 4 1/16	1500	10	hor. side by side	jump spark	pressure.	. . . . .	not governed.
Maxwell	780	2	horizontal	separate	water. . .	4 x 4	1200	10	hor. above.	jump spark	pressure.	thermo-siphon .	not governed.
Mitchell	750	2	vertical. . . .	separate	water. . .	4 x 4½	1500	9–10	head and side. .	jump spark	mechanical.	gear pump.	not governed.
Mitchell	1,000	4	vertical. . . .	separate	water. . .	3½ x 4	1500	14–18	head and side. .	jump spark	mechanical.	gear pumo.	not governed.
Mitchell	1,000	4	vertical. . . .	separate	water. . .	3½ x 4	1200	14–18	head.	jump spark	mechanical	. . . . .	not governed.
Moline	1,000	2	horizontal	separate	water. . .	4 ¾ x 5	. . . . .	. . . . .	top.	jump spark	forced.	gear pump.	not governed.
Northern	650	1	horizontal	separate	water. . .	4¾ x 6	800	7	vert. in head. . .	jump spark	splash.	gear pump.	not governed.
Olds	650	1	horizontal	separate	water. . .	5 x 6	650	7	hor. above.	jump spark	gravity.	gear pump.	not governed.
Pierce	900	1	vertical. . . .	separate	water. . .	3 5/16 x 4 5/16	1400	8	inl. over ex. . . .	jump spark	splash.	thermo-siphon .	not governed.
Pope-Tribune	900	2	vertical. . . .	. . . . .	water . . .	4½ x 4½	850	14	. . . . .	jump spark	mechanical.	gear pump.	not governed.
Queen	800	2	horizontal	separate	water. . .	4½ x 4½	1000	18	in head	jump spark	pressure.	gear pump.	not governed.
Reo	650	1	horizontal	separate	water. . .	4¾ x 6	650	8	on top.	jump spark	mechanical.	gear pump.	not governed.
Waltham Orient.	400	1	vertical. . . .	separate	air.	3½ x 4½	1000	4	inl. over ex. . . .	jump spark	splash.	. . . . .	not governed.
Wayne	800	2	horizontal	separate	water. . .	4½ x 4	1200	14	top.	jump spark	mechanical.	thermo-siphon .	not governed.

American Cars Selling Above $5,000.

Name	Price	No. of cyls.	Position of cyls.	Cyls. cast	Cooled by	Bore & stroke, ins.	R.P.M.	Rated H.P.	Valves Located	Ignition	Lubrication	Circulation	Carbureter
Apperson	$5,500	4	vertical. . . .	separate	water. . .	5½ x 5½	1000	50–55	opp. sides.	h. t. mag. .	pressure.	cent. pump. . . .	governed.
Bliss	7,000	4	vertical. . . .	in pairs. .	water. . .	4½ x 6	900	30	opp. sides.	h. t. mag. .	mechanical.	cent. pump. . . .	governed.
Lozier	5,500	4	vertical. . . .	in pairs. .	water. . .	4⅞ x 5½	1200	40	opp. sides.	h. t. mag. .	force feed.	cent. pump. . . .	not governed.
Matheson	6,000	4	vertical. . . .	separate	water. . .	5 x 6	600	40–45	in head.	magneto. . .	forced plunger. . .	cent. pump. . . .	governed.
Matheson	7,500	4	vertical. . . .	separate	water. . .	6 x 6	600	60	in head.	magneto. . .	forced plunger. . .	cent. pump. . . .	governed.
S. & M. Simplex	6,750	4	vertical. . . .	in pairs. .	water. . .	4½ x 5½	1000	30	opp. sides.	jump spark	circ. pump	cent. pump. . . .	governed.

American Cars Selling Above $1,000 to $2,000 Inclusive.

Name	Price	No. of cyls.	Position of cyls.	Cyls. cast	Cooled by	Bore & stroke, ins.	R.P.M.	Rated H.P.	Valves Located	Ignition	Lubrication	Circulation	Carbureter
Autocar	$1,800	4	vertical	in pairs	water	3½ x 4	1000	20	inl. head, ex. s.	jump spark	mechanical	cent. pump	not governed.
Columbia	1,750	2	horizontal	separate	water	5 x 4½	1000	18–19	hor. above	j. s. synch.	gravity	cent. pump	not governed.
Compound	1,400	3	vertical	in one	water	4 x 4 & 7	720	16	opp. sides	j. s. s. coil.	mechanical	gear pump	not governed.
Cleveland	2,000	4	vertical	in pairs	water	3¾ x 4½	.....	20	opp. sides	jump spark	mechanical	cent. pump	not governed.
Corbin	2,000	4	vertical	separate	air	4½ x 4½	.....	24	in head	jump spark	direct sight feed.	.....	not governed.
Corbin	1,800	4	vertical	separate	air	4½ x 4½	.....	24	in head	jump spark	direct sight feed.	.....	.....
Dayton	1,250	4	vertical	in pairs	water	3¾ x 3¾	1300	14	opp. sides	jump spark	mechanical	gear pump	not governed.
Dolson	1,250 1,500	2	horizontal	separate	water	5½ x 5	900 1000	20–24	hor. on top	jump spark	forced	thermo-siphon	not governed.
Duquesne	2,000	4	vertical	separate	air	3½ x 4	to 2000	16–21	head	jump spark	mechanical	.....	not governed.
Duryea	1,500	3	inclined	in one	water	4½ x 4½	900	12–15	side by side	make & b'k	splash	thermo-siphon	not governed.
Duryea	1,900	3	inclined	in one	water	5 x 5	900	25–30	side by side	make & b'k	splash	.....	not governed.
Elmore	1,500	3	vertical	separate	water	4½ x 4	900	24	ports in walls.	jump spark	mechanical	gear pump	not governed.
Franklin	1,400	4	vertical	separate	air	3½ x 3½	1500	12	head	jump spark	mechanical	.....	governed.
Franklin	1,800	4	vertical	separate	air	3½ x 3½	1500	12	head	jump spark	mechanical	.....	governed.
Glide	1,250	2	horizontal	separate	water	5 x 5	900	18	hor. side by side	jump spark	compression	gear pump	not governed.
Hewitt	1,500	1	horizontal	separate	water	4¾ x 6	1000	10	hor. on side	j. s. & mag.	forced g'r pump.	gear pump	not governed.
Jackson	1,250 1,500	2	horizontal	separate	water	5½ x 5	.....	20–24	vert. in head	jump spark	mechanical	gear pump	not governed.
Knox	1,900	2	horizontal	separate	air	5 x 6	600	14–16	head	jump spark	mechanical	.....	not governed.
Lambert	1,200	2	horizontal	separate	water	6 x 4	.....	16	hor. above	jump spark	mechanical	gear pump	not governed.
Lambert	1,500	2	horizontal	separate	water	6 x 4½	.....	18	hor. above	jump spark	mechanical	gear pump	not governed.
Lambert	2,000	4	vertical	in one	water	4½ x 5	900	34	in head	jump spark	force feed	eccentric	not governed.
Logan	1,500	2	horizontal	separate	water	4¾ x 5	1200	20	hor side by side.	jump spark	pressure	gear pump	not governed.
Logan	2,000	2	horizontal	separate	water	5½ x 6	1000	30	hor. side by side	jump spark	pressure	gear pump	not governed.
Marion	1,500	4	vertical	separate	air	4 x 4	1200	16	head	jump spark	.....	.....	.....
Maxwell	1,300 1,450	2	horizontal	separate	water	5 x 5	.....	19	hor. above	jump spark	comp. force feed.	thermo-siphon	.....
Mitchell	1,500	4	vertical	separate	water	4 x 4½	.....	18–20	head and side	jump spark	mechanical	.....	not governed.
Mitchell	1,800	4	vertical	separate	water	4½ x 5	.....	24–30	head and side	jump spark	mechanical	.....	not governed.
Moline	1,750	4	vertical	in pairs	water	4¾ x 4½	1100	18–20	side by side	jump spark	mechanical	cent. pump	not governed.
Northern	1,800	2	horizontal	separate	water	5½ x 5½	1200	20	hor. side by side	jump spark	gravity	gear pump	not governed.
Oldsmobile	1,250	2	vertical	separate	water	5 x 5	900	24	ports in walls.	jump spark	mechanical	gear pump	not governed.
Pope-Hartford	1,600	2	horizontal	separate	water	5 x 4½	900	18	inl. over ex	jump spark	forced	gear pump	not governed.
Premier	1,500	4	vertical	separate	air	3¾ x 4½	1250	16	in head	jump spark	forced	.....	not governed.
Pullman	2,000	4	vertical	separate	water	4½ x 4½	1200	24–28	.....	h. ten. syn.	mechanical	.....	not governed.
Pungs-Finch	1,850	4	vertical	.....	water	4 x 4½	1000	20	.....	jump spark	mechanical	gear pump	not governed.
Queen	1,100	2	horizontal	separate	water	5 x 5	1000	16	on top	jump spark	force feed	.....	not governed.
Queen	2,000	4	vertical	in pairs	water	4½ x 4½	.....	26	same side	jump spark	mechanical	gear pump	not governed.
Rambler	1,350	2	horizontal	separate	water	5 x 6	900	18	in head	jump spark	gravity	thermo-siphon	not governed.
Rambler	1,750	4	vertical	separate	water	4 x 4½	1000	20–25	.....	jump spark	mechanical	gear jump	not governed.
Reo	1,250	2	horizontal	separate	water	4¾ x 6	750	16	on top	jump spark	mechanical	.....	not governed.
Waltham Orient	1,600 1,750	4	vertical	separate	air	3½ x 4½	1000	16	side by side	jump spark	exhaust pressure	.....	not governed.
Waltham Orient	2,000	4	vertical	separate	air	4 x 4½	1000	20	side by side	jump spark	mechanical	.....	not governed.
Wayne	1,250	2	horizontal	separate	water	5½ x 5	.....	.....	.....	.....	.....	.....	.....

American Cars Selling Above $4,000 to $5,000 Inclusive.

Name	Price	No. of cyls.	Position of cyls.	Cyls. cast	Cooled by	Bore & stroke, ins.	R.P.M.	Rated H.P.	Valves Located	Ignition	Lubrication	Circulation	Carbureter
Apperson	$4,500	4	vertical	separate	water	5 x 5	1000	40–45	opp. sides	h. t. mag.	pressure	cent. pump	not governed.
Austin	4,100 4,500	4	vertical	separate	water	5½ x 5½	1200	60	inl. over ex	h.t.mag. & synch.	mechanical	gear pump	not governed.
Berkshire	4,500	6	vertical	separate	water	5½ x 6	900	50	opp. sides	jump spark	pump	.....	not governed.
Cadillac	5,000	4	vertical	separate	water	5 x 5	1200	50	side by side	jump spark	forced	cent. pump	not governed.
Chadwick	5,000	4	vertical	in pairs	water	5 x 6	1000	50	opp. sides	h. t. mag.	mechanical	gear pump	not governed.
Columbia	4,500	4	vertical	in pairs	water	5 x 5	800	40–45	side by side.	jump spark	pump	gear pump	governed.
Peerless	4,500	4	vertical	in pairs	water	5½ x 5½	1000	45	opp. sides	jump spark	mechanical	cent. pump	not governed.
Stearns	4,250	4	vertical	.....	water	4⅞ x 5½	1150	40–45	.....	h. t. mag.	pressure	.....	.....
Walter	4,750	4	vertical	in pairs	water	5½ x 6	1200	50	inl. hd. ex. side.	h. t. mag.	exh. pressure	cent. pump	governed.
Welch	4,250	4	vertical	separate	water	4¾ x 5	1250	45	in head	jump spark	mechanical	cent. pump	not governed.

the high-tension magneto with .06 per cent. The high-tension synchronized magneto is next, with .05 per cent., closely followed by the low-tension magneto, while the make-and-break type of ignition with batteries is hardly now to be considered. The use of two systems of ignition is also considered, but appears on one car only, although many makers will fit different systems of ignition at the option of the owner. This year also makers will fit different systems of ignition batteries, the dry batteries suffering in consequence, but the storage battery is confined to the higher-priced cars, as is the high- and low-tension magneto system of ignition.

The lubricating systems used are much more exact in action than has heretofore been the case, some method of furnishing oil in varying quantities proportionate to the speed of the motors being largely used,

(*Continued on page 316.*)

American Cars Selling Above $2,000 to $3,000 Inclusive.

Name	Price	No. of cyls.	Position of cyls.	Cyls. cast	Cooled by	Bore & stroke, ins.	R.P.M.	Rated H.P	Valves Located	Ignition	Lubrication	Circulation	Carbureter
Acme	$2,750	4	vertical	separate	water	4 x 5	1000	30–35	inl. over ex.	jump spark	forced	cent. pump.	not governed.
Aerocar	2,800	4	vertical	separate	air	4 x 4	1500	24	head	jump spark	mechanical		not governed.
Ariel	2,500	4	vertical	separate	water	4¾ x 4	1800	30	in head	jump spark	mechanical		not governed.
Autocar	2,600	4	vertical	separate	water	4 x 4½	1000	24	inl. over ex.	jump spark	mechanical	cent. pump.	not governed.
Berkshire	2,500	4	vertical	separate	water	4 x 4½	900	20	opp. sides	jump spark	pump	gear pump	not governed.
Berkshire	3,000	4	vertical	separate	water	4¾ x 5½	900	30	opp. sides	jump spark	pump	gear pump	not governed.
Cadillac	3,000	4	vertical	separate	water	4¾ x 5	1000	30		jump spark	pressure	gear pump	not governed.
Cadillac	2,500	4	vertical	separate	water	4¾ x 5	1000	30	side by side	jump spark	forced feed	gear pump	not governed.
Columbia	3,000	4	vertical	in pairs	water	4 x 4½	900	24–28	side by side	l. t. mag.	pump	cent. pump	governed.
Dolson	2,500	4	vertical	in pairs	water	5 x 5	1200	40–45	side by side	jump spark	forced	gear pump	governed.
Dorris	2,500	4	vertical	in pairs	water	4½ x 5	1000	30	in head	jump spark	mechanical	gear pump	not governed.
Elmore	2,500	4	vertical	separate	water	4½ x 4	900	35	ports in walls.	jump spark	mechanical	gear pump	not governed.
Ford	2,500	6	vertical	separate	water	4½ x 4½	1200	40	side by side	h. t. mag.	mechanical	gear pump	not governed.
Franklin	2,800	4	vertical	separate	air	4 x 4	1500	20	in head	jump spark	mechanical		governed.
Frayer-Miller	3,000	4	vertical	separate	air	4 1/16 x 5½	1500	24	hor. in head	jump spark	mechanical		not governed.
Glide	3,000	4	vertical	separate	water	4½ x 5	1200	36	side by side	jump spark	mechanical	gear pump	not governed.
Grout	2,500	4	vertical	separate	water	4½ x 5	1100	30	side by side	jump spark	forced feed	gear pump	not governed.
Haynes	2,250	4	vertical	separate	water	4½ x 5	1000	30	opp. sides	jump spark	gravity		
Iroquois	2,500	4	vertical	in pairs	water	4½ x 5	1200	34–40	opp. sides	h. t. synch.		gear pump	not governed.
Jackson	2,500	4	vertical	in pairs	water	5 x 5	1200	40–45	side by side	jump spark	mechanical	gear pump	not governed.
Lambert	3,000	4	vertical	in one	water	4½ x 5	900	34	in head	jump spark	forced	eccentric	not governed.
Locomobile	3,000	4	vertical	in pairs	water	4¾ x 4½		22		l. t. mag.	mechanical	gear pump	
Marion	2,500	4	vertical	separate	air	4½ x 4½	1100	24–28		jump spark	splash		not governed.
Marmon	2,500	4	inclined	separate	air	4½ x 4	1500	20–24	in head	jump spark	forced		not governed.
Marmon	3,000	4	inclined	separate	air	4¾ x 4½	1500	26–30	in head	jump spark	forced		not governed.
Moline	2,500	4	vertical	in pairs	water	4½ x 5	1100	30–35	side by side	jump spark	mechanical	gear pump	not governed.
Moon	3,000	4	vertical	separate	water	4½ x 5	1200	30–35	side by side	jump spark		gear pump	not governed.
National	3,000	4	vertical	separate	water	4½ x 5	1200	35–40	side by side	j. s. dyn'mo	mechanical	gear pump	not governed.
Northern	2,800	4	vertical	in one	water	4½ x 5	900	30	in head	jump spark		gear pump	not governed.
Olds	2,250	4	vertical	in pairs	water	4½ x 4½	1000	26–28	side by side	jump spark	forced	gear pump	not governed.
Pope-Hartford	2,500	4	vertical	separate	water	4½ x 5½	1050	25	in head	jump spark	forced	gear pump	not governed.
Pope-Toledo	2,800	4	vertical	separate	water	3¾ x 4½	800	20		jump spark	forced	gear pump	not governed.
Premier	2,250	4	vertical	separate	air	4½ x4½	1400	20–24	in head	jump spark	mechanical		not governed.
Pullman	2,000	4	vertical	separate	water	4½ x 4½	1200	24–28	opp. sides	h. t. synch	mechanical	gear pump	not governed.
Pullman	2,500	4	vertical	separate	water	4½ x 5	1200	30–35	opp. sides	j. s. synch.	mechanical	gear pump	not governed.
Pungs-Finch	2,200	4	vertical	in pairs	water	4½ x 5	900	28–32	opp. sides	jump spark	mechanical	gear pump	not governed.
Rambler	2,500	4	vertical	separate	water	5 x 5½	1200	35–40	in head	jump spark	mechanical	gear pump	not governed.
Reo	2,500	4	vertical	in pairs	water	4½ x 5	750	24	side by side	jump spark	mechanical	gear pump	not governed.
Stevens-Duryea	2,500	4	vertical	separate	water	3⅞ x 4½	1200	20	side by side	jump spark	mechanical	cent. pump.	not governed.
Stoddard-Dayton	2,500	4	vertical	separate	water	4½ x 5	1200	36	side by side	jump spark	mechanical	gear pump	governed.
Studebaker	2,600	4	vertical	in pairs	water	3½ x 4½	1000	20–24	opp. sides	jump spark	mechanical	cent. pump.	not governed.
Studebaker	3,000	4	vertical	in pairs	water	4½ x 4½	1100	28–32	side by side	jump spark	mechanical	cent. pump.	not governed.
St. Louis	2,200	4	vertical	in pairs	water	4½ x 5	1000	30–34	side by side	jump spark	mechanical	gear pump	not governed.
St. Louis	2,500	4	vertical	in pairs	water	4½ x 5	1200	32–36	side by side	jump spark	mechanical	gear pump	not governed.
Upton	2,500	4	vertical	in pairs	water	4¾ x 4½	1000	24–30	side by side	jump spark	mechanical	gear pump	governed.
Upton	3,000	4	vertical	in pairs	water	4⅞ x 5	900	35	side by side	jump spark	mechanical	gear pump	governed.
Waltham Orient	2,250	4	vertical	separate	air	4 x 4½	1000	20	side by side	jump spark	mechanical		
Wayne	2,500	4	vertical	in pairs	water	4¾ x 5	1300	35	opp. sides	jump spark	mechanical	gear pump	not governed.
Winton	2,500	4	vertical		water	4¾ x 5	1100	30		jump spark	mechanical	cent. pump.	not governed.

American Cars Selling Above $3,000 to $4,000 Inclusive.

Name	Price	No. of cyls.	Position of cyls.	Cyls. cast	Cooled by	Bore & stroke, ins.	R.P.M	Rated H.P.	Valves Located	Ignition	Lubrication	Circulation	Carbureter.
Acme	$3,500	4	vertical	separate	water	4½ x 5	1000	30–35	opp. sides	jump spark	forced	cent. pump.	not governed.
Ardsley	3,500	4	vertical	in pairs	water	4¾ x 5½	900	30–35	opp. sides	jump spark	pressure	cent. pump.	not governed.
Cleveland	3,500	4	vertical	in pairs	water	4½ x 5½	1200	30–35	opp. sides	l.t. mag.	mechanical	cent. pump.	not governed.
Franklin	4,000	6	vertical	separate	air	4 x 4	1500	30	in head	jump spark	mechanical		governed.
Frayer-Miller	4,000	6	vertical	separate	air	4 1/16 x 5½	1500	36	hor. in head	jump spark	mechanical		not governed.
Haynes	3,500	4	vertical	separate	water	5½ x 6	1100	50	opp. sides	jump spark	mechanical	cent. pump.	governed.
Hewitt	4,000	4	vertical	in pairs	water	4 x 5½	1200	25	side by side	j. s. and make and break.	gravity	gear pump	not governed.
Knox	4,000	4	vertical	separate	air	4¾ x 5½	1300	35–40	in head	j. s. mag.	rotary pump		not governed.
National	4,000	6	vertical	separate	water	4½ x 5	1200	50–60	side by side	jump spark	mechanical	gear pump	not governed.
Packard	4,000	4	vertical	in pairs	water	4½ x 5½	1200	24	opp. sides	h. t. mag.	mechanical	cent. pump.	not governed.
Peerless	3,750	4	vertical	in pairs	water	4½ x 5	1000	30	opp. sides	jump spark	mechanical	cent. pump.	not governed.
Pierce	4,000	4	vertical	separate	water	4½ x 4½	1550	28–32	opp. sides	jump spark	rotary pump	rotary pump	not governed.
Rainier	3,500	4	vertical	in pairs	water	4 x 4½	1300	22–28	opp. sides	jump spark	mechanical	cent. pump.	not governed.
Rainier	4,000	4	vertical	in pairs	water	4½ x 5½	1150	30–35	opp. sides	l. t. mag.	mechanical	cent. pump.	not governed.
Royal	3,500	4	vertical	in pairs	water	5 x 5½	800	40	opp. sides	jump spark	mechanical	cent. pump.	governed.
Studebaker	3,700	4	vertical	in pairs	water	4½ x 5½	1100	30–35	opp. sides	l. t. mag.	mechanical	cent. pump.	not governed.
Thomas	3,500	4	vertical	separate	water	5½ x 5½	1000	50	opp. sides	h. t. synch.	pump		not governed.
Walter	4,000	4	vertical	in pairs	water	5 x 5½	1200	40	inl. hd. ex. side.	h. t. mag.	exh. pressure	cent. pump.	governed.
Wayne	3,500	4	vertical	in pairs	water	5½ x 5	1150	50	opp. sides	jump spark	mult. fd. & spl.	mechanical	not governed.

TWO-CYCLE AND FOUR-CYCLE ENGINES.—II.*

By C. P. MALCOLM.

WE will now consider the action of a two-cycle engine, first from a theoretical standpoint, and describe the ideally perfect action, before we examine into its actual performance. We take this course so that we may be able to judge intelligently, not only of any radical departure from the established or ordinary construction of a two-cycle, but also of the little details that make up the sum total of an engine, and decide whether any or all of them tend to make the action nearer to the ideal than the older way.

Action of Two-Cycle Motor.

The radical difference between the two-cycle and the four-cycle is in the entirely different methods employed to get the exhaust gases out of and the fresh charge into the cylinder. As we have seen in our study of the four-cycle, only one end of the piston is used in it to do all the work. One stroke draws in the charge, the second or return stroke compresses it, the third is the power stroke, and the fourth, or second return stroke, pushes out the exhaust or burned products of the combustion that produced the power stroke.

In the ordinary two-cycle, both ends of the piston are used to perform this work with the purpose of doing it in one-half the time and with one-half the number of mechanical movements; or, as their names indicate, a complete cycle of events to produce an explosive impulse is accomplished in two strokes of the one, while four strokes of the piston are required to obtain an explosive impulse in the other. In the two-cycle the upper end of the piston is used to make the compression stroke, and also to receive the force of the explosion and impart to the crank the power impulse of the power stroke, the same as in a four-cycle, while the lower or crank end is used to perform the functions of the intake and exhaust strokes of the four-cycle. In order to do this the crank and connecting rod are inclosed in an air-tight case and become, in fact, the other (lower) end of the cylinder, the piston working between the two ends as in a steam engine, except that in gas engine practice the ends of the cylinder are kept far enough away from the end of the piston stroke, to give the compression space for a predetermined pressure. In vertical, two-cycle engines we call the upper space the combustion chamber or compression space, and the lower end the crank chamber. As there is a distance equal to the length of the connecting rod and the throw of the crank between this end of the cylinder and the piston, the compression is quite light. It is considered good practice to make this crank chamber as small as practical, bringing its sides in close to the crank arms and extending them up to near the end of the piston travel and economize space wherever possible. The compression in the crank chamber will be from 3 pounds to 5 pounds, according to how close the space is economized. Care must be taken to have this chamber air-tight, stuffing boxes or a reliable substitute being used to keep the charged air from escaping through the crankshaft journals. Leaks are very wasteful of power in any gas engine, and inexcusable on any plea.

Following the Cycle.

We will now consider the engine in action. The crank chamber is full of explosive mixture, admitted on the up-stroke of the engine, and the piston is descending on its power stroke. The piston compresses lightly the explosive mixture in the crank chamber, and as the piston approaches its lower center it uncovers the cylinder exhaust port and the pressure from the nearly expended force of the explosion escapes through it to the atmosphere. The exhaust port should open so much in advance of the inlet port that the cylinder is entirely relieved from pressure before the inlet port is uncovered. As compression instantly heats, so also in expansion the temperature keeps exact pace with the pressure, and the expansion of the exhaust cools it so rapidly that it will not ignite the incoming charge, although it was a bright flame before the exhaust port opened.

As the piston continues its downward stroke the inlet port opens, and the explosive mixture compressed in the crank chamber rushes into the cylinder, the deflector throws the inflowing jet up the inside of the walls to the upper end of the cylinder, and the dead gas occupying this space is forced out toward the exhaust port. If the full displacement of the piston has been compressed in the crank chamber, and the cylinder ports have capacity enough to let in so much of the explosive mixture compressed in it, so that atmospheric pressure is restored in the crank chamber, exactly the same quantity of charge has entered the cylinder, as a four-cycle of the same capacity would have drawn in on its suction stroke. And if the deflector is of the right shape, so that it has thrown this charge in a solid column that has driven the exhaust out of its way instead of mixing with it, we have the same condition of charge as in a four-cycle, except that a purer charge will be in the top and inlet side of the cylinder, and the exhaust remaining in the cylinder will be in the part adjacent to the exhaust port.

The piston now begins to ascend, and in doing so it draws a charge from the carbureter into the crank-chamber with its lower end and compresses the charge that has passed into the cylinder with its upper end; but as no compression can take place while the ports are open, the first action will be a slight displacement of the contents of the cylinder, pushing them out through the open ports. If done slowly, as when turning the engine over by hand, it can readily be seen that the suction of the lower end as well as the compression of the upper end of the piston, would both tend to transfer a little of the last of the charge that entered the cylinder back into the crank-chamber, until the inlet port closed. When the engine is running at reasonably fast speed, however, the charge is entering the cylinder from the crank-chamber at a high speed when the piston begins its upstroke, and the inertia of this rapid current of gases will make it impossible for any back-flow to set in, within the infinitely small space of time between the commencement of the upstroke and the closing of the intake port; so in practice we can safely count on all of the displacement being forced out through the exhaust port (of that part of the contents of the cylinder most convenient to it), which will only be the exhaust gases if the deflector has performed its functions ideally and all of the displacement that passes out through the exhaust port will leave the charge remaining in the cylinder—after the exhaust port closes, and compression begins—that much purer than it would have been without this displacement. From this we see that what at first thought would seem to be an excessively wide exhaust port is really a positive advantage in engine efficiency, as well as in enabling us to run the engine at the highest possible speed without the least danger of firing back into the crank-chamber.

Ideal and the Real.

Now if we could get anywhere near some such action in actual practice, we would never hear any question about the efficiency of the two-cycle engine, but we find we never do get nearly as much charge

*Concluded from page 79, issue of January 11

into, and that there is always a great deal more exhaust left in a two-cycle cylinder than there is in a four cycle. We will therefore try to point out some of the principal reasons, hoping that we may be of practical assistance to all readers who may desire to select, operate, or design a gas engine or automobile. We will begin at the carbureter and trace the action through to the exhaust. A majority of two-cycle engines have no valves whatever. The inlet from the carbureter into the crank chamber is a port, that the piston covers air tight until the lower end of the piston passes it near the upper center of the piston stroke. The partial vacuum produced in the crank chamber by the upstroke of the piston will be from two to five pounds, depending upon the designing of the engine. The higher pressure insures quicker and more complete transference of the charge from the crank chamber into the cylinder, and the vacuum formed by the up stroke will equal the pressure of the down, if the inlet opening does not occur until the end of the stroke. When the inlet to the crank chamber is thus suddenly opened, the gas from the carbureter rushes in with considerable force.

It is difficult to determine with certainty the real action, and, consequently, it is a serious problem to make a carbureter that will work with precision under such trying conditions. We know that there is a decided flow back from the crank chamber through the carbureter; but whether the inertia of the gas rushing in at such high speed has a "ramming effect," so as to fill the crank chamber with more than its normal volume, a part of which escapes before the port closes; or, as is more probable, the piston displacement on the down stroke before the port is covered causes the flow back through the carbureter, is a problem as yet unsolved.

Certain Sizes Assumed.

For convenience of expression we will assume that our engine has four inches of stroke, and that our intake port into the crank chamber is 1-2 inch wide. We cannot get any compression until this port is covered unless we do get some benefit of the "ramming effect" before referred to, and the pressure in the crank chamber is above atmosphere when the port is closed. We will suppose our cylinder inlet port is 1-2 inch wide. Then when the piston has traveled three inches after the crank chamber port is closed, the cylinder inlet port opens, and the compressed charge rushes into the cylinder at considerable speed while the compression is high, but very slowly as the pressure diminishes. When the upstroke of the piston commences, not all of the charge has gone into the cylinder, the amount of the loss depending upon the capacity of the cylinder port, the speed the engine is running at, and smallness of the crank chamber, but when added to the loss through the crank chamber port, we see that much less than a normal charge enters the cylinder. With the dimensions of ports given, we cannot utilize by mechanical means more than 3 inches of the 4-inch stroke, for, although, when the cylinder intake port begins to open, the piston still has 1-2 inch more of crank chamber compression stroke to make, we must also remember that that port is open for 1-2 inch of the suction stroke and it will suck back gas from the cylinder into the crank chamber again until the port closes.

It is doubtful if much or any gas is actually drawn back into the crank chamber when the engine is running at reasonable speed, because the movement of the gas is so sluggish at light pressures that there will be some slight pressure in the crank chamber when the piston begins its upstroke, and the first effect of which will be to relieve that pressure and as the piston continues its upward movement before there is vacuum enough produced to cause a perceptible flow back, the port will be closed. The inertia of the gas causes a moment of hesitation, similar to the moment when the gas current stops flowing into the cylinder and begins to flow back into the crank chamber, so that if the ports are intelligently designed with these actions in mind there is no doubt but we get the full 3 inches of piston stroke charge into the cylinder, but this is all we do get.

Discussing the Deflector.

We now come to the deflector, and this is the thing that requires the most careful thought. It is given the least attention, and contributes more to the dissatisfaction with the two-cycle engine than any other one thing that I know of, although there has been much improvement in this direction within the past few years. I have often seen the cylinder inlet port of a 6-inch bore cylinder not more than two inches in length. This means that the entire charge starts up on one side of the cylinder, in a column 2 inches wide and 1 inch or 1 1-2 inches "thick," making a rainbow circuit and no small amount of it passing on out through the exhaust port, leaving the great mass of exhaust gases on both sides of it in the cylinder practically undisturbed. Then the shape of the deflector is a very nice thing to determine. It would require an entire article by itself to go into the matter with any degree of thoroughness, and I have not yet seen a deflector on any engine on the market that performs its functions with any great degree of completeness. The ideal deflector will project the incoming charge in a solid column, and, keeping between the cylinder walls and the burned gases, push them in a mass toward and out of the exhaust port.

The inlet port as well as the deflector must extend nearly half-way around the internal circumference of the cylinder, and the exhaust port nearly the other half; in a 4-inch-bore cylinder, I would not have more than a 1-inch bridge or partition between them; then, to keep the piston rings from spreading out and catching into the ports, one or two narrow bridges across both the inlet and exhaust ports. Of course the piston rings must be pinned so as to make the cut in the rings always pass over a bridge, or the cut ends of the ring will catch in the ports and the rings will break. It is found to be better to make the exhaust port wide, so as to clean out more of the exhaust by the cylinder displacement on its up or compression stroke, and make the compression space correspondingly smaller, so as to get the same compression that would be obtained if 1 inch of the compression stroke was not lost. On a 4-inch stroke, I would recommend 1 inch width for the exhaust and 1-2 inch for the inlet ports. With ports of this width and as nearly around the circumference as practicable, there will be ample capacity for as complete a change of gas while the piston is passing its lower or slow center as a four-cycle can make in the full stroke of the piston. The exhaust port is open during more than one-third of a revolution, and the inlet port during more than one-quarter of a revolution, as against one-half of a revolution in the case of the four-cycle —while the four-cycle has not one-quarter of the valve capacity of these two-cycle ports.

Speed and Power Efficiency.

An engine with 4 inches of stroke mad with such ports as this, and of reasonably good design otherwise, throughout, will work with high efficiency at any speed up to 2,000 revolutions per minute, providing the inlet to the crank chamber is all right. To attain high speed with corresponding power efficiency, that is to have approximately twice the power at 2,000 revolutions per minute as at 1,000 revolutions per minute, all of the ports must have large capacity and the crank chamber space must be reasonably small. However, the inlet port to the crank chamber must be kept narrow for the reasons explained before, and get its capacity by length around the circumference, being careful always to have bridges enough and to have one set of bridges correspond with those of the cylinder, so as to have the cut of the piston rings pass over.

My own choice for the inlet to the crank chamber is a check valve of large area, small lift, very light construction, made of aluminum. In that case there is no loss of crank chamber compression while the piston is closing a port, there is no sudden pull upon the carbureter and, besides, it is always ready to respond to the slightest vacuum in the crank chamber, and take advantage of any "ramming effect" referred to before, and also of any syphoning action that may be set up in the exhaust, which latter may be left for future discussion. The check valve can be hinged instead of a straight lift, to lessen the noise at high speed. If hinged and faced with leather, it is practically noiseless at all speeds.

(*Continued on page 319.*)

National 6- and 4-Cylinder 1906 Models.

TWO models, one a six-cylinder 50-60-horsepower touring car, and the other a four-cylinder 35-40-horsepower touring car, constitute the 1906 line of the National Motor Vehicle Co., of Indianapolis, Ind. Apart from the fact that Model E, the six-cylinder car, has more power, a longer wheelbase, somewhat heavier parts and a more roomy body than Model D, the four-cylinder machine, the two are alike; in general appearance, also, the two machines are quite similar, the only differences being in dimensions and a few details. The following description, will, therefore, answer for both cars, differences in dimensions and constructional features being noted where they occur.

The motors are alike in all respects except in the number of cylinders. The cylinders are individually cast, with the usual modern arrangement of integrally cast water jackets, heads and valve chambers; the bore is 4 1-2 inches and the stroke 5 inches. The exhaust and inlet valves are alike, being interchangeable, and the two valves for each cylinder are placed in a common chamber; the inlet valves are mechanically operated from the same camshaft that operates the exhaust valves. Steel rollers, bronze-bushed, are placed on the cam ends of the push-rods. Three long bearings carry the camshaft, which can be removed without taking off the lower half of the crankcase.

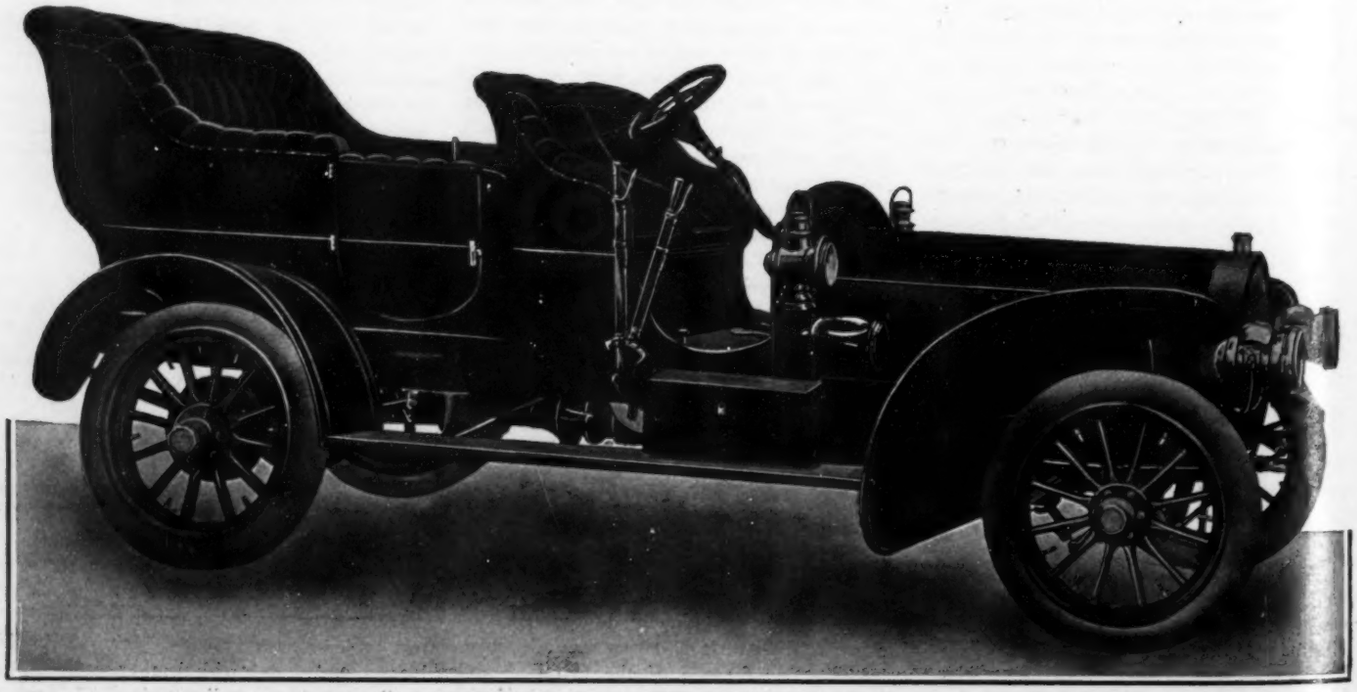
Pistons are each fitted with four rings, 1-4 inch wide. The connecting rods are of steel and the bearings at both ends are adjustable; the piston pin is hollow.

The lower half of the horizontally divided aluminum crankcase has partitions dividing it into as many compartments as there are cranks; the upper half carries the bearings, so that the lower half can be removed without disturbing other parts. The crankshaft bearings are of babbitted bronze, and are five in number in the four-cylinder engine and seven in the six-cylinder engine, each crank being supported on both sides. These bearings are adjustable. The four-cylinder motor has a large hand-hole, closed by a plate, in its crankcase; the larger engine has two hand-holes. In each case the openings are on the side opposite the valves. The flywheel is secured to the crankshaft by being bolted to a flange formed integral with the crankshaft—a method of attachment adopted by a large number of automobile and motor manufacturers.

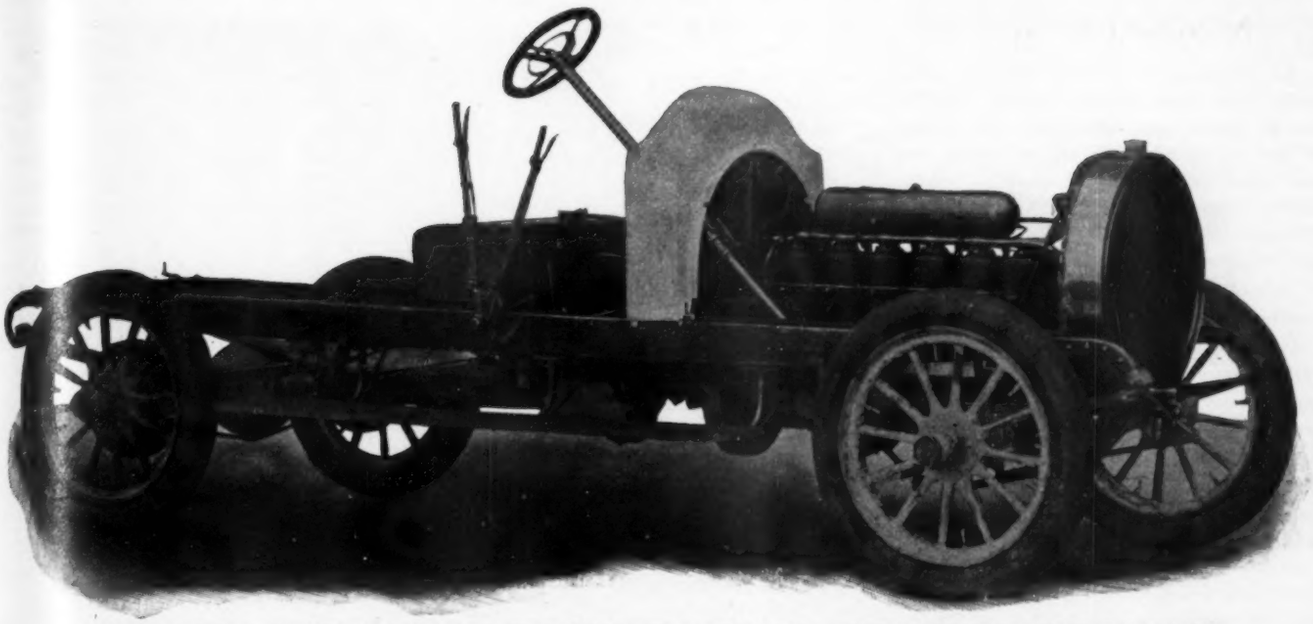
The cooling system includes a gear-driven gear pump, a circular radiator of the cellular type, which is a prominent characteristic of the National car, and a six-bladed belt-driven fan running on ball bearings. A simple coupling connects the pump to the end of the camshaft; the entire pump can be taken off after removing four bolts. The camshaft gears are enclosed in a housing formed partly in the crankcase end and partly in a cover casting bolted on. The water capacity in the four-cylinder car is five gallons; in the six-cylinder car, seven gallons.

Ignition is by jump spark, the plugs being placed in the tops of the valve chambers, directly over the exhaust valves. Current is furnished by batteries and a dynamo. In the case of the four-cylinder car there is a set of dry cells and a storage battery; the six-cylinder car has two storage batteries. The dynamo is mounted on the base of the dashboard with its shaft in a vertical position, and comes up through the floor boards. A bevel friction wheel on the armature shaft is kept against the motor flywheel by a spring; when the maximum dynamo speed has been reached the friction wheel is withdrawn from contact with the flywheel by a centrifugal governor, and returned as the speed decreases, thus keeping the dynamo from burning itself out or damaging the winding by over-production of current. The dynamo current is used to charge the storage battery, from which the ignition current is taken, the dry cells being used in case of emergency. In the six-cylinder car an automatic cut-out switch is placed on the dashboard to break the circuit between the dynamo and battery when the voltage of the dynamo falls below that of the battery, as when the engine is running so slowly that the dynamo current falls off considerably.

This ignition arrangement has several advantages, as there are really three sources of current supply, for the dynamo can be used to furnish current directly through the coils if both sets of batteries should become inoperative, though the manufacturers of the National car do not state whether or not special provision is made for such connection. The vibrator coils are mounted on the dash, there being one coil for each cylinder. The timer is mounted on a vertical shaft driven by spiral gearing from the rear end of the camshaft; a ball governor, mounted in a casing on the vertical shaft below the timer, automatically advances and retards the spark according to the speed of the motor. The usual ignition timing lever is placed on the steering wheel,



SIDE VIEW OF THE SIX-CYLINDER NATIONAL TOURING CAR EQUIPPED WITH SIDE-ENTRANCE TULIP BODY.



CHASSIS OF THE 1906 NATIONAL SIX-CYLINDER SHAFT-DRIVEN TOURING CAR. NOTE DISTINCTIVE CIRCULAR RADIATOR.

but acts on the governor, and not on the timer directly.

The wiring of the ignition system is unusually well protected; the high-tension cables, heavily insulated, are carried through hard fiber tubes and connected to their respective plugs by means of rubber-covered chains. The primary wires are encased in lead tubing. Lubrication is effected by a Hill oiler with leads for the more important bearings. The four-cylinder car has a six-feed oiler, while the six-cylinder car has seven feeds.

For relieving compression when starting the engine there is a cock on each cylinder. These cocks are all connected together by a rod with a handle which extends through the dashboard and can be easily reached from the driver's seat.

The inlet piping and the exhaust manifolds are secured in their places by a stud and yoke arrangement, making the removal and replacing of the piping a quick and simple task. The water piping runs along the top of the engine, both the hot water outlet and the cool water inlet being connected with the water jackets through the jacket heads. Above the cylinders is a large cylindrical oil tank, from which oil is carried by gravity to the Hill lubricator. This position of the reservoir ensures warmed and easy-flowing oil while the engine is running.

The muffler is made up of several concentric cylinders of sheet metal, the gases escaping from one chamber to another through perforations. A cut-out is fitted to the rear end.

The clutch is a large aluminum cone with a spring-backed leather facing; there are six springs, slightly arched and placed in suitable recesses formed in the face of the aluminum cone. The clutch engages very smoothly, owing to the action of the springs. An interlocking mechanism connects the clutch pedal with both brakes and with the gear-shifting lever, so that the application of either brake withdraws the clutch, and the gears are locked in position while the clutch is engaged, thus preventing the changing of gears without the withdrawal of the clutch. Between the clutch and the transmission gearbox is a very heavy universal joint to prevent binding of the engine and transmission shaft bearings in case of twisting of the framing.

An aluminum casing with removable upper half contains the transmission gears, which give three speeds forward and a reverse. On the high speed the drive is direct, the primary shaft being coupled to the forward end of the propeller shaft by means of a heavy claw clutch. Gear changing is effected by a single lever, the gears being engaged progressively from reverse to high speed. The transmission shafts run in annular ball bearings. The case is made oil-tight and lubrication effected by oil placed inside in the customary way. The inspection plate on the top of the transmission gearcase can be reached through the foot boards.

The motor and transmission gearcase are hung, by means of the usual arms cast on their casings, from a sub-frame suspended well below the level of the main frame. The sub-frame is of pressed steel, as are also the cross-members to which it is attached at each end.

The propeller shaft is enclosed in a heavy steel tube which is bolted rigidly to the spherical bevel gear casing on the rear axle, and extends forward to the rear end of the transmission gearcase; it is attached by a swiveled yoke to a cross-member of the frame, the swivel yoke permitting sufficient movement back and forth to compensate for the vertical movement of the frame with relation to the axles. The universal joint at the rear of the transmission gearcase is also a slip-joint, allowing for the variation of distance between transmission gearcase and rear axle. The propeller shaft runs in annular ball bearings.

Heavy steel tubes, extending outward from the spherical bevel gearcase to which they are brazed, enclose the two halves of the live rear axle and support the weight of the car. The entire live axle runs in annular ball bearings. Both inner and outer ends of the live shafts are squared, the inner ends fitting into square holes in the large gears of the differential and the outer ends into steel caps which constitute dog clutches to engage and drive the hubs of the rear wheels. A large cover on the bevel gear casing permits free access to the interior for the inspection, adjustment and even the removal of the gears, without disturbing other parts of the rear live axle system, or removing the rear wheels. The rear axle is strongly trusssd.

An interesting and novel braking arrangement consists of a pair of concentric integrally formed drums attached to the hubs of the rear wheels. Each drum has its contracting band, one pair forming the emergency brake and the other the regular service brake, the first applied by lever and the second by pedal. Braking surfaces are metal to metal. The transmission brake used on the 1905 National is not now used.

In both four-cylinder and six-cylinder cars the wheels are 34 inches in diameter. In the large car the tires are 4 1-2 inches in diameter, while in the smaller machine the tires are 4 inches in diameter; all wheels run on annular ball bearings. The front axle is of heavy steel tubing, deeply dropped. One of the two connecting rods between the arms of the steering knuckles is placed in front of the axle; the other is behind the axle. This system of double connecting rods was found to work very satisfactorily last season and, with many

other features of the 1905 car, has been retained.

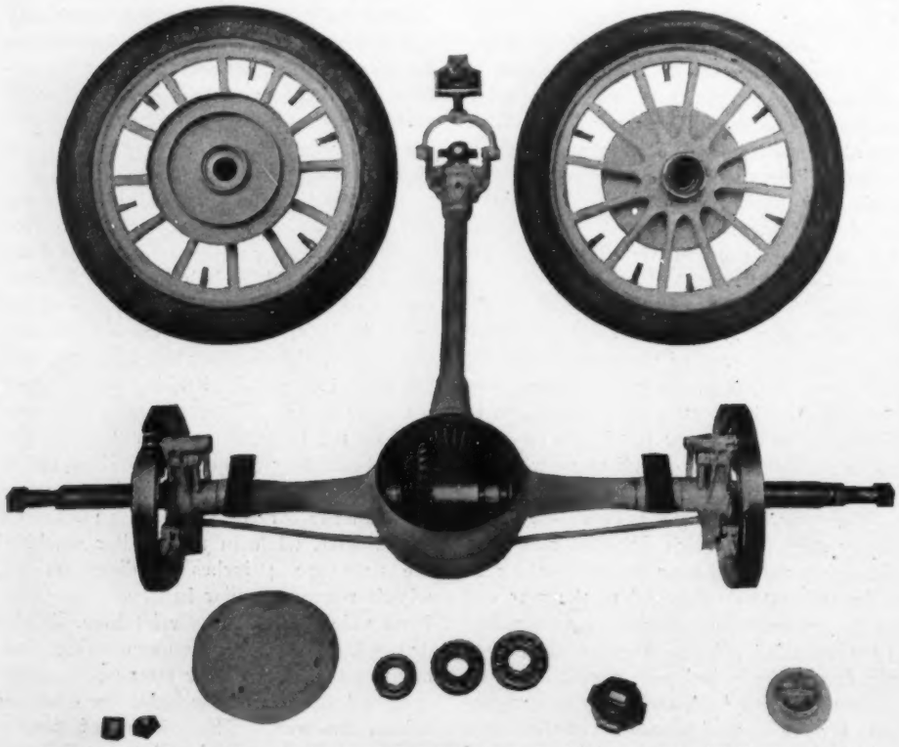
All the springs in both cars are semi-elliptic; the front springs in both machines are 40 inches long, while the rear springs of the six-cylinder car are 56 inches long and those of the smaller machine are 50 inches long. Framing is of pressed steel throughout, including cross-members and sub-frames. The frame of the large car has a maximum depth of 5 inches and the smaller car a maximum of 4 inches.

The bodies of the National cars are of cast aluminum; the tonneaus are high-backed and can be removed. Front seats are divided. Model D carries five passengers, there being ample room on the rear seat for three, while Model E carries seven, there being folding seats in the tonneau for two. All passengers face forward. The dashboard is made with an aluminum outer part and a wood center to which the coil box, switch, oiler and other accessories are attached; the general form of the dash is the concave style that is now so popular. The bonnet is semi-cylindrical in form, corresponding to the form of the radiator and of the upper part of the dashboard. Mudguards are very large and are connected by the usual running boards. Stowage space for tools is provided by a box on the right hand running board and there is also a compartment under the tonneau seat. The gasoline tank is placed under the front seat and is of approximately rectangular shape with rounded corners; the tank of the large car holds 20 gallons, and the small car 17 gallons. Steering gear is of the worm and gear type and is, of course, irreversible. The wheelbases are 104 inches and 121 inches for the smaller and the larger car respectively.

Model D is equipped when sold with two gas headlights, generator, oil side lamps and a tail lamp, storm apron, horn and tools. The larger car has a similar equipment except that the side lamps and the tail lamp are fitted to use either oil or electricity, the necessary current being supplied by one of the storage batteries.

Model E limousine consists of a limousine body mounted on the regular six-cylinder chassis. This machine carries seven passengers, two occupying folding seats in the enclosed body, but facing toward the rear. The body of this car is of sheet aluminum. A special storage battery for the interior and exterior electric lights is carried in the enclosed body. The upholstering and equipment of this car are of the luxurious and complete character required in a car of this type.

The finish of the National cars is the same as in 1905. Bodies are finished in dark blue with black mouldings and gold striping. Running gear is straw-colored, with black striping, but blue with gold striping is given as an option.



DETAILS OF PROPELLER SHAFT DRIVE, DIFFERENTIAL CASING, REAR AXLE, AND REAR WHEEL BRAKES OF NATIONAL TOURING CAR.

Premier 20-24-Horsepower Air-cooled Car.

THE principal product for 1906, and the only wholly new model manufactured for this season by the Premier Motor Mfg. Co., of Indianapolis, Ind., is a touring car with a four-cylinder vertical motor of 20-24 horsepower, air-cooled, like all the Premier motors, but, unlike the others, placed with cylinders fore and aft. The smaller Premier cars remain practically as they were in 1905 and have their cylinders placed transversely. In all models the engines are under a bonnet at the front of the car.

Though the new car, designated as Model L, follows conventional touring-car lines in a general sense, it embodies a number of interesting features in the matter of details.

The motor has individually cast cylinders, like other air-cooled motors, with heads and radiating flanges cast integral, and valve housings bolted on; the flanges cover the barrels of the cylinders to a point below the lowest level reached by the top of the piston, and also the cylinder heads and valve chambers. The valve arrangement is an uusual one, and is a conspicuous feature of the motor. The valves open directly into the cylinders through the heads and are set at an angle, so that the stems, which extend upward, are at an angle of 25 degrees from the vertical, leaning outward. Valve springs are all outside, where they are as far removed as possible from the source of heat. There are two camshafts, one on each side of the motor; the camshaft for the inlet valves is on the left-hand side and the shaft for the exhaust valves on the right. The valves, however, are oppositely arranged—that is, the inlet valves are on the right and the exhaust valves on the left. Each cam operates a push-rod in the usual way. The rod extends upward and is jointed to one end of a rocker arm pivoted at its center on a bracket attached to the top of the cylinder; the opposite end of the rocker arm, reaching across to the opposite side of the cylinder, presses down the valve stem when the push-rod, rising on the cam, rocks the pivoted arm.

The arrangement is in many respects similar to the valve arrangement of the Premier racing car built for the Vanderbilt cup race. In the racer, however, the camshaft was carried above the cylinders and below the rocker arms, the long push-rods thus being unnecessary; a vertical shaft, gear-driven from the crankshaft, was geared to the camshaft. In the touring car the camshafts are driven by helical gears housed in the forward end of the crankcase. The valves have cast-iron heads and steel stems.

The cylinders have a bore and stroke of equal measurement—4 1-4 inches. The pistons are fitted with four rings each, two above and two below the piston pin; the rings are 5-16 inch wide, are cut at an angle of 45 degrees, and are held from turning by pins screwed into the piston. The piston pins are of hardened and ground

NEW MODEL PREMIER 20-24-HORSEPOWER 4-CYLINDER VERTICAL AIR-COOLED MOTOR-IN-FRONT TOURING CAR.

steel, bored out, and are 3-4 inch in diameter; the poston-pin ends of the connecting rods are bronze-bushed and are not adjustable. The big ends are split and fitted with renewable Parsons white bronze bearings. When the bearings are set up there are eight thin sheet metal liners between the two halves. As the bearings wear, liners can be removed and the slack taken up; a total wear of 1-8 inch is provided for. The caps are held on by cap-screws provided with lock plates.

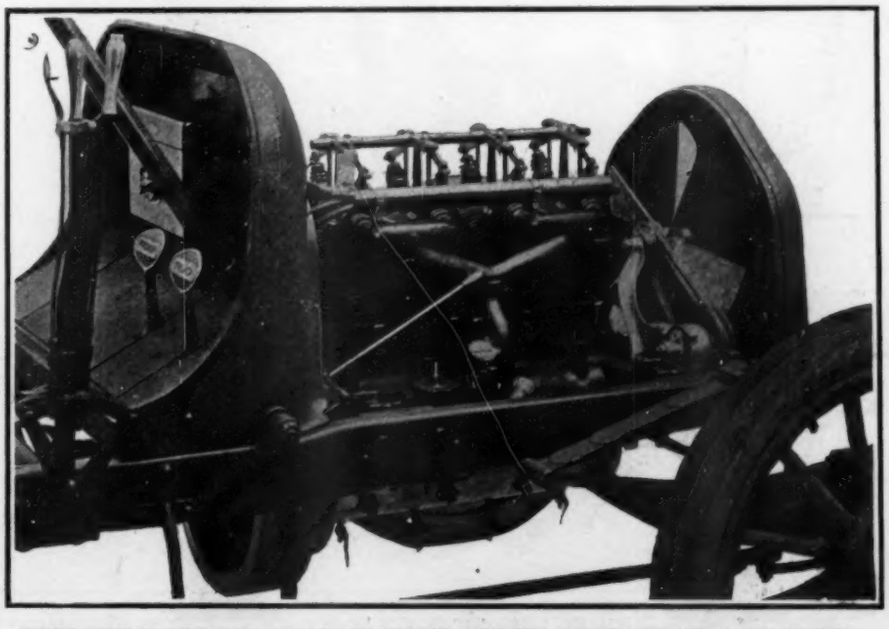
The crankshaft has a flange at its rear end to which the flywheel is bolted. There are five bearings; the main bearing at the flywheel end is 1 5-8 inches in diameter, and the others are 1 1-2 inches in diameter. The upper half of the crankcase, to which the bearings are attached, is of iron, while the lower half, having practically no heavier duty than carrying oil, is of aluminum and very light. The arms by which the engine is supported are cast integral with the upper half and are of box form, strong and stiff.

Lubrication is effected by a force feed mechanical lubricator placed under the footboard and pumping oil through sight feeds placed in a gang on the dash. This arrangement saves dashboard space and keeps the oil tank where a little oil spilled in filling can do no harm. Ignition is by jump spark; the timer is said by the builders to be of a special type and is manufactured at the Premier factory, as is also the carbureter. A fan is placed at the front of the motor, behind the circular wire netting screen in the front end of the bonnet, and is driven by belt. The circulation of air is assisted by the fan-blade spokes of the flywheel.

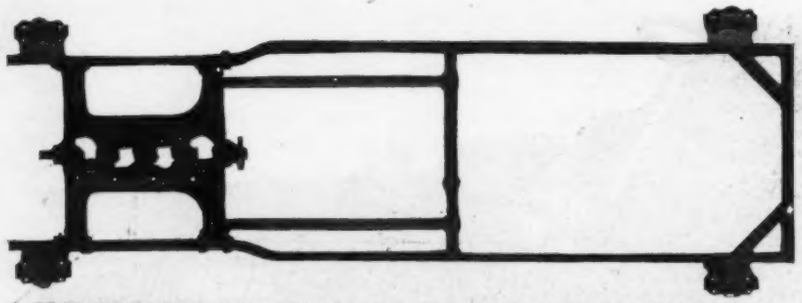
An interesting feature of the car is the framing system. The main frame is of the well-known pressed steel type, narrowed at the front. There is a pressed steel cross member at the rear end, the corners being braced by unusually large double gusset plates; and another cross member of the same material is placed about the middle of the frame. The arms cast on the upper half of the crankcase are bolted to the frames at each side, no other front cross members being used; there are two pairs of these arms, one pair at the front and the other at the rear. From the rear pair of arms to the middle cross member of the frame extend two steel tubes, forming a sub-frame on which the transmission gear-case is hung; the ends of the tubes are babbitted into sockets in the cross frame—an unusual method in frame construction. The accompanying illustration of the separate frame will show the arrangement of the parts clearly.

The sliding transmission gears give three forward speeds and one reverse, control being obtained by a single selective lever; all gears are case-hardened and have ground teeth. A multiple disk clutch is used, having seven plates; four plates are carried on studs attached to the flywheel and three on the triple-splined clutch shaft. The clutch is controlled by a side lever, which, after withdrawing the clutch, applies the emergency brake during the latter part of its motion. The usual side lever is employed for shifting the change-speed gears.

Drive from the transmission to the rear axle is by propeller shaft and bevel gears, the propeller shaft having two universal



INLET SIDE OF PREMIER AIR-COOLED MOTOR SHOWING VALVE-ACTUATING MECHANISM.



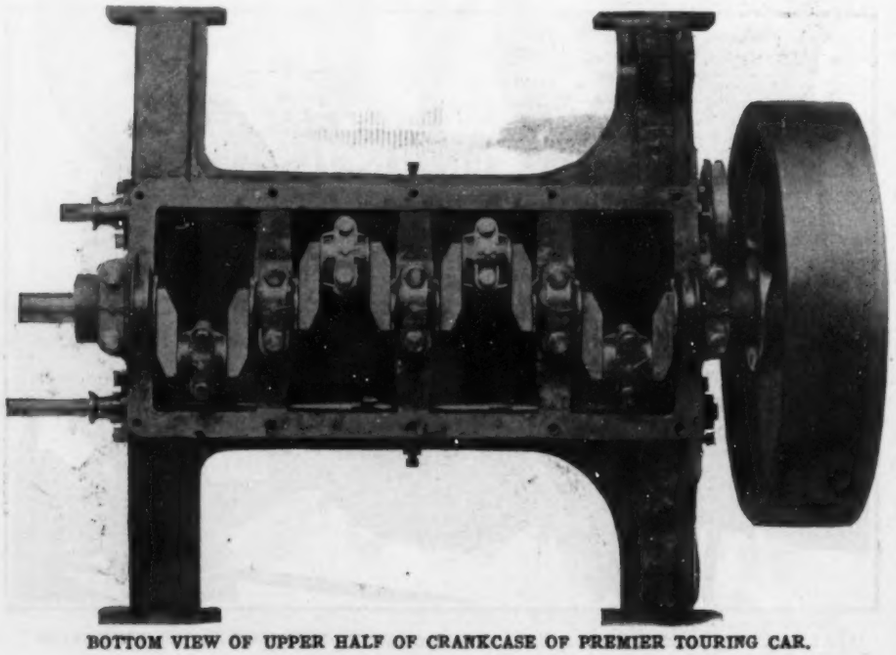
PLAN VIEW OF PRESSED STEEL FRAME AND MOTOR BASE OF PREMIER CAR.

joints. The rear axle housing is made up of a cast-steel bevel gear casing, from which extend two drawn steel tubes. The live shafts, running inside the steel tubes, are carried at their inner ends in annular ball bearings and at their outer ends in roller bearings. The rear wheels are keyed to the tapered ends of the live shafts. The differential is of the 12-pinion type; the bevel gears are case-hardened. A heavy tubular torsion rod extends from the gear housing to the middle cross member of the frame.

The front axle is of I-beam section and is tested, the manufacturers state, under a load of 7,000 pounds, which it must sustain without deflection.

The wheels are 32 inches in diameter and are fitted with 4-inch tires; the wheelbase is 106 inches and the tread 56 1-2 inches. Brakes are placed on the transmission, just at the rear of the gearcase, and on the hubs of the rear wheels. The gasoline tank contains 13 gallons. The weight of the complete car is 2,000 pounds.

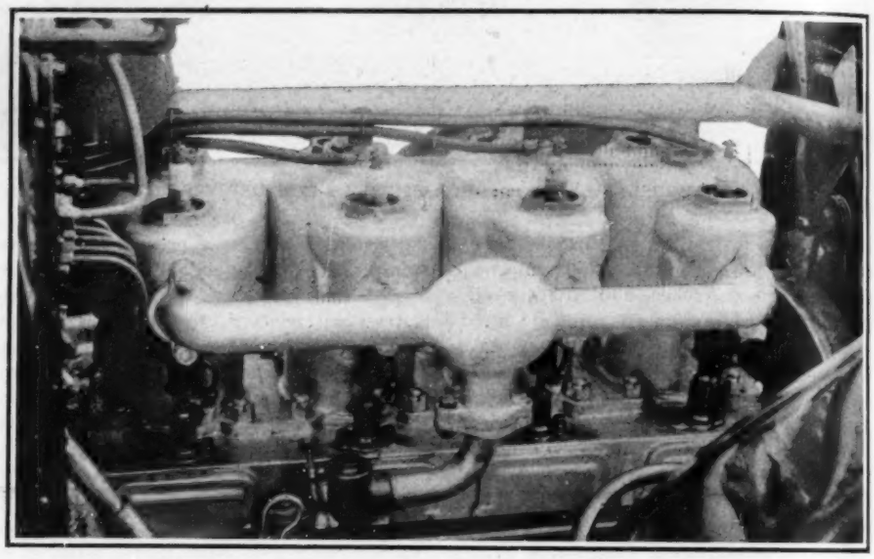
The dashboard is cast from aluminum, and is of the popular concave form. The lower part of each outer edge is extended toward the rear seat, affording some additional protection to the occupants of the front seat in muddy weather. The body is made of wood and is finished in Brewster green. Five persons can be carried comfortably. The tonneau is detachable, so that the car can be converted into a powerful runabout or "cross-country" car.



BOTTOM VIEW OF UPPER HALF OF CRANKCASE OF PREMIER TOURING CAR.

In addition to the new touring car, the Premier Mfg. Co. is building the 16-horsepower runabout and light touring car on the same lines as in 1905, the only changes being in a few minor details. These machines have four-cylinder air-cooled motors placed transversely under a wide bonnet in front, driving by chain to the planetary transmission and from the transmission by another chain to the live rear axle. Several different types of body are fitted to the new touring car and also to the smaller chassis; the larger chassis takes a limousine and two styles of touring body, while the smaller chassis is fitted with four different bodies, one being a coupé. In addition to pleasure cars the Premier Co. manufactures a light, air-cooled commercial wagon which has already been described in these pages.

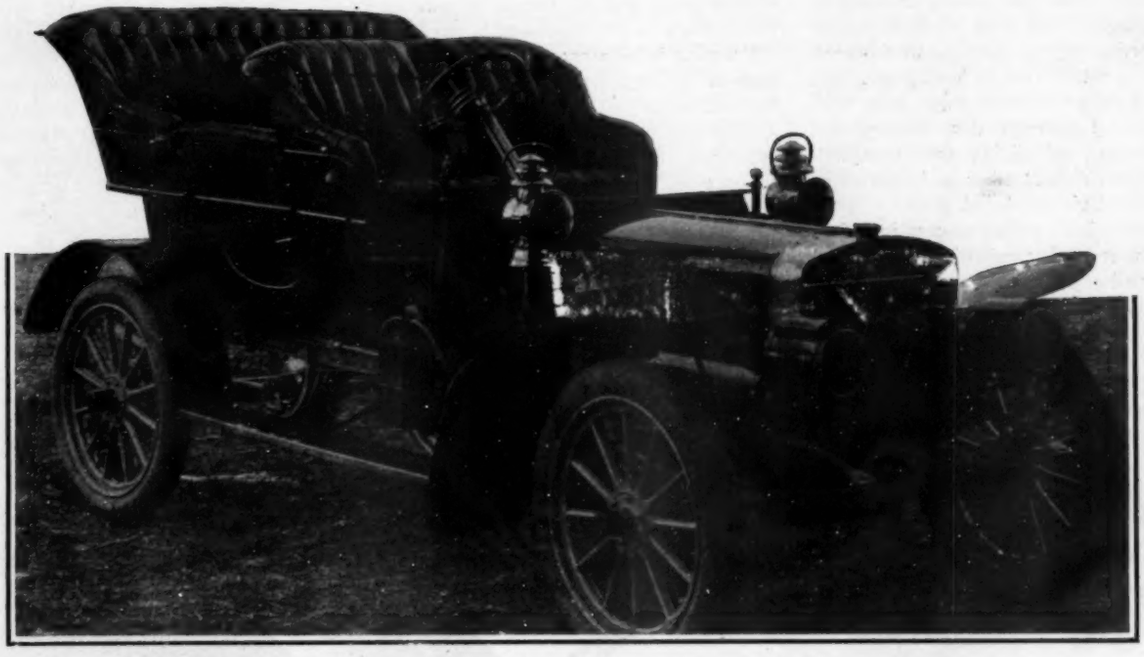
The new touring car is equipped, when sold, with two acetylene gas headlights, a separate gas generator, two oil side lamps, an oil tail lamp, a horn, set of tools, and a tire repair outfit.



INLET SIDE OF FOUR-CYLINDER MOTOR OF THE NEW MAXWELL TOURING CAR.

Maxwell 4-Cylinder Car.

A new four-cylinder 36-horsepower car has just been placed on the market by a concern which hitherto has built only double-opposed cylinder motors—the Maxwell-Briscoe Motor Car Co., Tarrytown, N. Y. While the new machine is built on lines similar, in a general way, to those of other medium-powered touring cars, there are a number of interesting details in which current practice is not followed. The motor is made in a single casting, openings for the adjustment of the connecting-rod bearings being placed in the crankcase. A rearward extension of the crankcase carries the multiple disk clutch and transmission gearing, insuring alignment. The motor and transmission, forming a single unit, are carried on a three-point suspension. The cooling water is allowed to circulate naturally. The arrangement of engine and transmission in a single unit, the three-point suspension and the thermo-syphon water circu-



QUARTERING VIEW OF THE 1906 MODEL ST. LOUIS TOURING CAR BUILT AT PEORIA, ILL.

lation are features familiar to those who know the Maxwell two-cylinder cars. The shaft and bevel gear drive is also retained, the thrust of the bevel pinion being taken by a bevel roller running on the smooth surface of the back of the gear opposite to the pinion. The motor develops 36 horsepower at 900 revolutions a minute, and has cylinders of 5 inches bore and 5 inches stroke. Valves are mechanically operated, are all alike, and are placed on opposite sides of the engine. An oil pump, which is made an integral part of the motor, supplies lubricant to each cylinder, the amount of oil delivered being always in proportion to the speed of the engine. The manufacturers state that the oiling system is adjusted permanently at the factory, and needs no further attention in this respect. The oil tank holds a little more than a gallon.

The car is so geared that its maximum speed with full load is 50 miles an hour. According to the builders, the gearing used, together with the easy working of the multiple disk clutch, makes it possible to run the car practically all the time on the high gear, lower gears being resorted to only under extraordinary circumstances. The control of the clutch and of the emergency brake have been concentrated in a single side lever, the first part of the swing of the lever withdrawing the clutch and the last part of the movement applying the brake. The body of the car is made of stamped steel, and carries five passengers comfortably.

St. Louis 1906 Models.

The two models which are being manufactured for the 1906 trade by the St. Louis Motor Car Co., of Peoria, Ill., are both

NEW MAXWELL FOUR-CYLINDER VERTICAL MOTOR-IN-FRONT 36-HORSEPOWER TOURING CAR. THIS MAKER HAS HITHERTO BUILT CARS WITH DOUBLE-OPPOSED MOTORS EXCLUSIVELY.

touring cars of the type usually covered by this designation, and bear a close resemblance, particularly in mechanical features. Type XV. is rated at 30-34 horsepower, and Type XVI. at 32-36 horsepower, both cars having vertical four-cylinder, water-cooled motors, three-speed sliding gear transmissions, multiple disk clutches and final drive by propeller shaft and bevel gears.

The motors have cylinders cast in pairs; the valves are all mechanically operated and, being all exactly alike, are interchangeable. They are placed all on one side of the motor. All the gears are inclosed and run in oil; the motor bearings are bronze bushings.

A storage battery furnishes current for the jump spark ignition; a four-unit coil is hung on the dashboard.

The radiator is made up of flat copper tubing, the tubes being placed horizontally; thin copper fins are strung on the tubes. The usual fan is placed behind the radiator.

The clutch, of the multiple disk type, has alternate plates of steel and bronze, and is controlled by a pedal; the clutch interlocks with the emergency brakes, so that the application of the brake automatically withdraws the clutch.

The three-speed sliding gear transmission is inclosed in a casing which is rigidly connected with the motor crankcase by an intermediate member partly surrounding the flywheel; this feature of the St. Louis car was illustrated and described in detail in THE AUTOMOBILE in connection with the 1905 car. Transmission gears are of six pitch and are hardened; a single lever controls all speeds. The drive is direct on the high speed.

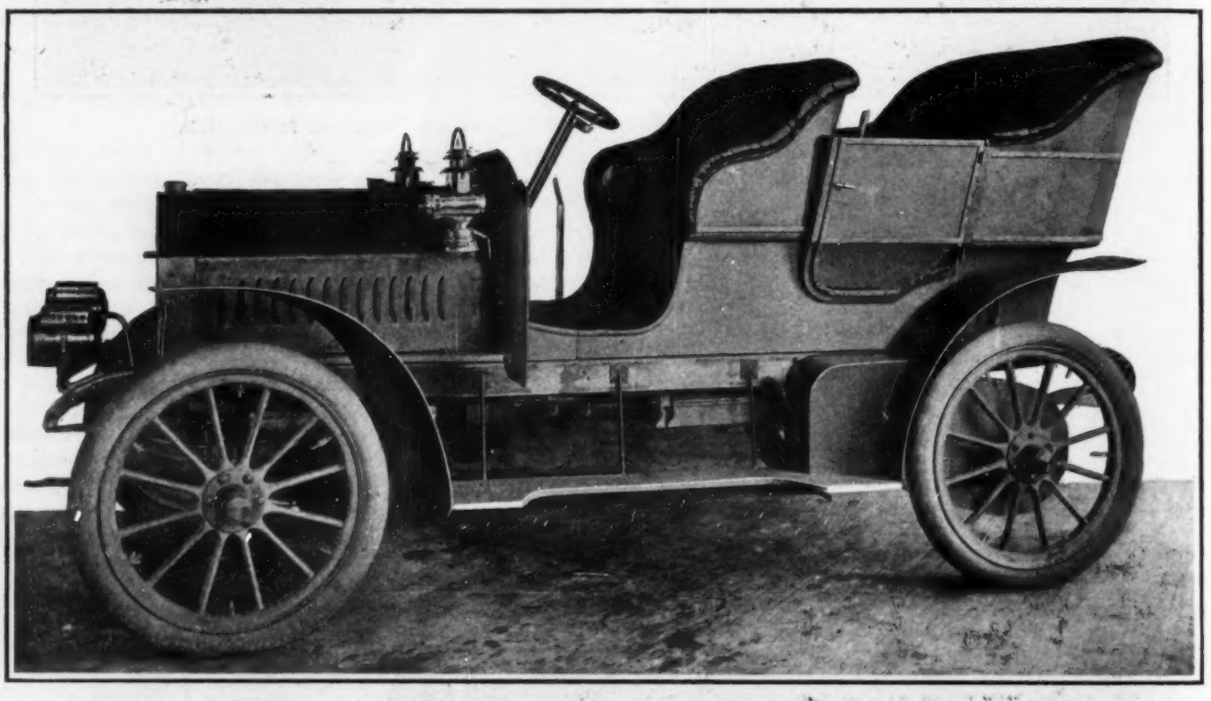
Brakes are placed on the rear hubs and on the transmission, the latter being operated by pedal and the former by side lever; the hub brakes are equalized.

Framing is of pressed steel. The wheelbase of the larger car is 108 inches and of the smaller one 104 inches; in both cars the wheels are 32 inches in diameter, with 4-inch tires. Steering gear is of the rack and pinion type, with ball and socket connecting rod joints adjustable for wear.

The bodies are finished in blue with cream-colored running gears; any other finish may be had, however, on special order. The manufacturers give 2,200 pounds as the weight of each car, and a maximum speed of 50 miles an hour is claimed for each. Headlights, side lamps, and tail lamp are supplied with each car, together with horn, tools, and an extra spark plug.

Crawford 24-28-Horsepower Touring Car.

THE car which is the most important model manufactured by the Crawford Automobile Co., of Hagerstown, Md., for the 1906 trade, belongs to the large and popular class of moderate sized, moderately powered touring cars, built on conventional lines and designed to withstand the severe duty imposed by all-around service on American roads.



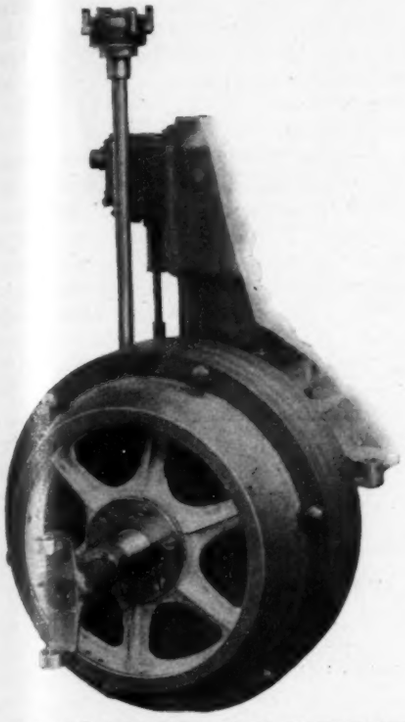
CRAWFORD FOUR-CYLINDER 24-28-HORSEPOWER SIDE-ENTRANCE LIGHT TOURING CAR WITH SIDE CHAIN DRIVE.

The four-cylinder vertical water-cooled engine is placed under the bonnet in front, and drives through a leather-faced cone clutch, sliding gear transmission and side chains to the rear wheels. The framing is of pressed steel and the sub-frame of steel angles. The body is of the side-entrance type, with divided front seats, and has a total carrying capacity of five persons. The motor is rated at 24-28 horsepower and the maximum speed of the car is stated by the manufacturers to be about 36 miles an hour.

The motor has individually cast cylinders of 4 1-2 inches bore and 4 1-2 inches stroke. The crankshaft runs in five bronze bearings having an aggregate length of 14 1-2 inches. Force feed lubrication is employed. Ignition is by jump spark, with quadruple coil on the dashboard; the timer is carried on the upper end of a vertical shaft, gear-driven, placed directly in front of the dashboard. The motor is hung on an angle iron sub-frame, brazed together; the transmission gearcase is carried by the same frame, a double universal and slip joint being interposed between the motor and the gear-case. The main framing is of pressed steel.

The clutch is of the inverted cone type. Instead of engaging with an internal cone formed in the flywheel, as in the usual type of cone clutch, the inverted cone, as its name implies, faces away from the flywheel and engages with an internal cone in a casting bolted to the flywheel; when going into engagement the clutch moves toward the rear. The clutch spring is between the flywheel and the cone. When the clutch is engaged the thrust is self-contained, and when disengaged the thrust is taken by a ball bearing. The usual pedal is used for controlling the clutch.

Sliding gears give three forward speeds and a reverse. The control is of the selective type, there being two sliding units on the squared shaft, one for reverse and low speed and the other for the second and high speeds; the high speed is engaged by



CRAWFORD INVERTED CONE CLUTCH AND TIMER ON VERTICAL SHAFT BACK OF MOTOR CYLINDERS.

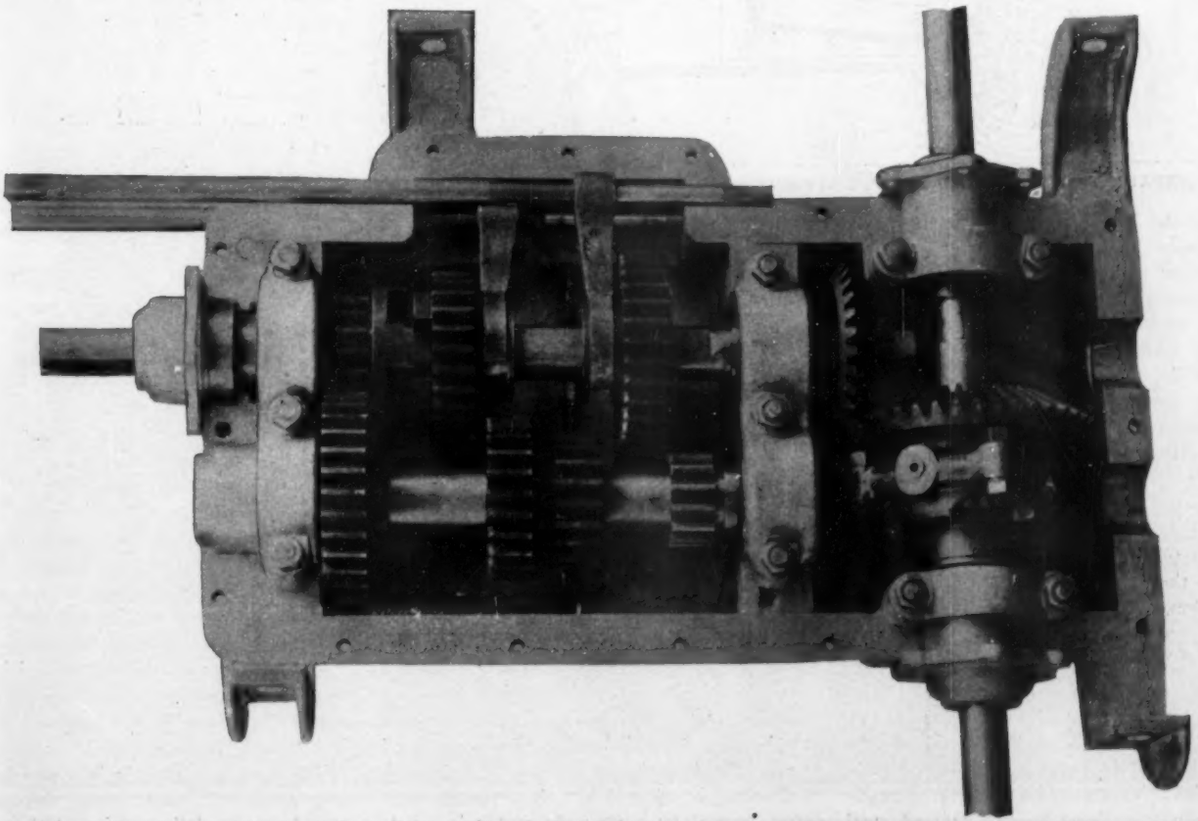
interlocking a claw clutch which gives direct drive, the countershaft running idle. The single control lever has but one neutral point, and to this point it must be returned before a change can be made. From the neutral point any speed can be engaged at once without passing through any other gears. The bevel driving gears and the bevel gear differential are enclosed in a housing in the rear end of the gearcase, the partition between the two compartments forming a support for the bearings for the rear ends of the transmission shafts. All three shafts—primary and secondary transmission shafts and jackshaft—run in ball bearings. A large removable plate gives access to the gears for making inspection or adjustments. The arrangement of the transmission gears will be clearly seen in the engraving showing the transmission. The outer ends of the jackshaft are supported by swinging ball bearings attached to the side frames of the car; strut rods are attached to separate ball bearings on the jackshaft so that the movement of the car on the springs cannot tighten or loosen the chain.

The sprockets through which the side chains drive the rear wheels are carried on sleeves which are formed integral with the wheel hubs; the brake drum is carried on the same sleeve. The sleeve is supported by a four-inch roller bearing. This arrangement brings the chain close to the car frame, out of the way of the running-board and step. Leather boots enclose and protect the chains.

Heavy steel tubing is used for both front and rear axles. The springs are 1 7-8 inches wide, the front springs 38 inches long and the rear springs 2 inches longer. There are two sets of brakes; the emergency brakes, operated by a hand lever and acting on the drums, already mentioned, carried on the rear wheel hub sleeves, and the regular service brakes, controlled by a pedal and acting on drums on the jackshaft. There are two drums on the jackshaft, one on each side of the differential, so that the differential is not required to transmit braking effort.

All working parts of the car are attached to the frame, so that the car can be run without the body. The wheelbase is 100 inches and the tread standard, 56 inches. Wheels are 34 inches in diameter and run on ball bearings; tires may be either regular clincher or mechanically fastened, at the purchaser's option.

CRAWFORD REAR WHEEL HUB INTEGRAL WITH BRAKE DRUM, TO WHICH CHAIN SPROCKET IS BOLTED.

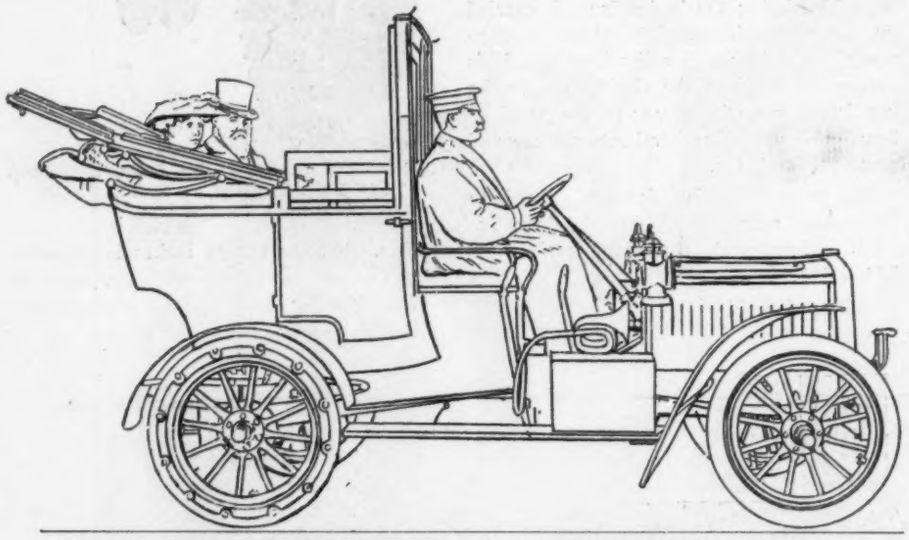


GEAR CASE OF CRAWFORD THREE-SPEED SELECTIVE-GEAR BALL-BEARING TRANSMISSION WITH COVER REMOVED. SHOWING ALSO BEVEL GEAR DRIVE TO COUNTERSHAFT DIFFERENTIAL IN REARWARD EXTENSION OF CASE.

The dashboard is of the dished type. Special arrangements have been made in the body for stowage. A compartment under the front seat will take the largest suit case. A drawer under the tonneau floor will take a tire in its natural shape, leaving room within the circle for other articles. A space under the rear seat will take wraps and so on. Still another drawer is placed under the front of the body, and in this tools and spare parts may be kept. A leather portfolio is attached to the back of the front seat. The weight of the complete car is 2,100 pounds.

Ford Chassis for London Cabs.

An interesting enterprise has been inaugurated in London, England, in the form of an automobile cab service in which the vehicles used are 20-horsepower gasoline chassis of American manufacture fitted with landaulet bodies built in London. The chassis were built by the Ford Motor Co., of Detroit, Mich., and are the same as the chassis used in the regular Ford 20-horsepower touring car, having four vertical water-cooled cylinders, planetary transmission and shaft and bevel gear drive to the live rear axle.



LANDAULET BODY ON FORD 20-H.P. CHASSIS IN LONDON, ENGLAND, CAB SERVICE.

The body is said to be very roomy for its type; in fine weather the hood can be lowered, making the car practically an open one. A special overlapping joint makes the top waterproof in wet weather. Communication between passenger and driver is arranged for, and the side and front windows are adjustable. The service is being operated by the Automobile Cab Co., Limited, of London.

Reo Motor-in-front Car.

A four-cylinder touring car, with vertical motor in front developing 24-horsepower, is the latest model placed on the market by the Reo Motor Car Co., of Lansing, Mich. This machine is built on regular touring car lines, having pressed steel frame, sliding-gear transmission, giving three forward speeds and a reverse and shaft and bevel-gear drive to the rear axle. The machinery is protected by a steel pan.

The cylinders of the engine are cast in pairs, the water spaces entirely surrounding the cylinders. Valves are mechanically operated and are all placed on the same side of the cylinders; valves are interchangeable, being exactly alike. With a bore of 4 1-4 inches and a stroke of 5 inches, the motor develops 24-horsepower at 1,000 revolutions a minute.

Phosphor bronze and spring steel plates, alternately disposed, form the multiple disk clutch, which runs constantly in oil in a tight casing. The manufacturers state that the clutch is sufficiently smooth in engaging to permit starting the car on the high gear without difficulty or discomfort. The sliding-gear transmission gives three forward speeds, with direct drive on the high gear; the gears are of hardened steel with teeth of six pitch, and the gear shafts run on ball bearings. The transmission gearcase is hung on the same sub frame that supports the engine.

Ignition is by jump spark, there being a quadruple coil mounted on the dash; current is supplied by a 100 ampere-hour storage battery of two cells, carried on the running board. A six-feed mechanical force-feed oiler is placed on the dash, where it is easily reached for making adjustments and filling.

The emergency brakes or the hubs of the rear wheels have drums 12 inches in diameter; the friction surfaces are bronze and steel. The side lever which applies this brake is interconnected with the clutch, so that the clutch is disengaged before the brake is applied. A foot brake acts on a drum on the transmission shaft. A second pedal operates the clutch independently of the brake. Both the pedals can be adjusted to suit the driver's convenience as to height.

Cooling is effected by a honeycomb radiator, backed by a fan; the water is circulated by a gear pump, positively driven. The steering gear is of the screw and nut type, the ignition and throttle levers being placed over the wheel and remaining stationary, notwithstanding the movements of the steering wheel.

The car has a wheelbase of 100 inches; the wheels are 32 inches in diameter, and are fitted with 4-inch tires. All springs are semi-elliptic; the front springs are 40 inches long and 1 3-4 inches wide, while the rear springs are 50 inches long and 2 inches wide. The car weighs 2,000 pounds. Wood is the material of which the side entrance, straight-line body is made; five passengers can be carried comfortably. The standard equipment of the car includes a folding top which, when up, extends forward as far as the dash; two gas headlights with separate generator, two oil side lamps, oil tail lamp and set of tools.

Pope-Tribune Touring Car.

The Model V Pope-Tribune touring car, with two-cylinder vertical motor, is very similar in its 1906 form to the 1905 model; the engraving on the next page shows the outward appearance of the machine. The motor is placed under the bonnet in front, and is rated at 12-horsepower; the cylinders are water-cooled, the water being circulated by a centrifugal pump gear-driven from the camshaft. The transmission is of the sliding-gear type, giving three forwards speeds and a reverse; final drive is by propeller shaft and bevel gears. Ignition is by jump spark. Angle steel is used for the framing. Brakes are fitted on drums on the hubs of the rear wheels and on the propeller shaft. A worm gear, which the manufacturers state is free from back lash, is used for the steering.

The double side entrance body is finished in an attractive brown with gold striping; the seating capacity is four persons. The wheelbase is 85 inches and the tread standard 56 inches; wheels are 30 inches in diameter, and are fitted with 3 1-2-inch tires. The gasoline tank holds eight gallons. The car weighs approximately 1,500 pounds.

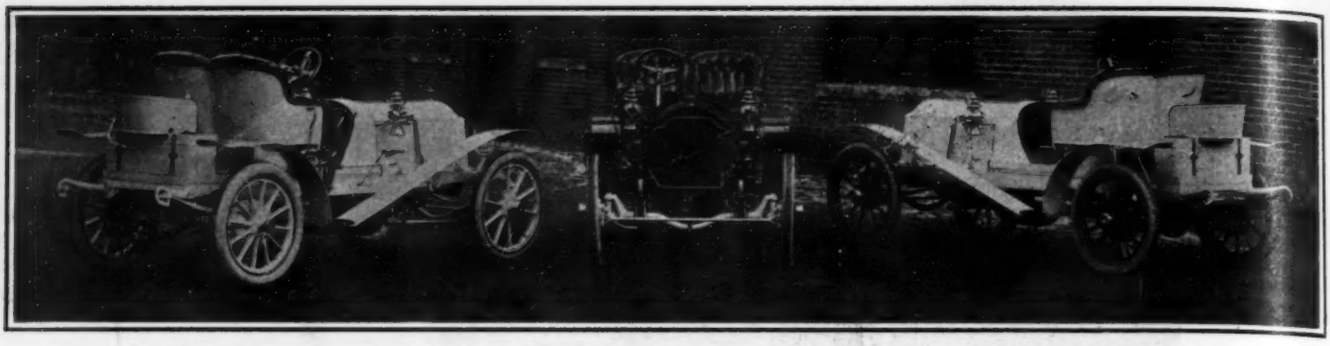
The Heine-Velox Car.

An interesting example of car building is found in the four-cylinder car built by the Heine Motor Car Co., of San Francisco, and just rechristened the Velox. The conditions to be met with in and around San Francisco call for a large reserve of power, many of the grades encountered being sharp pitches of more than 20 per cent. and in some cases reaching 30 per cent. To negotiate these gradients without undue difficulty a car must be powered high and at the same time be able to generate a considerable pull with the engine running at less than maximum speed.

The Velox is already in active service in and around 'Frisco, three demonstrating cars being in daily service, with a number

NEW MODEL REO 24-HORSEPOWER VERTICAL MOTOR-IN-FRONT TOURING CAR EQUIPPED WITH FOLDING TOP.

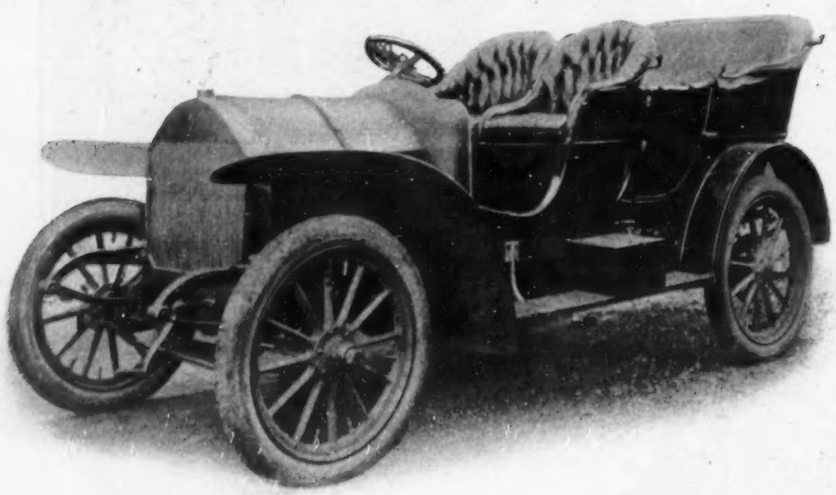
POPE-TRIBUNE TWO-CYLINDER VERTICAL MOTOR-IN-FRONT LIGHT TOURING CAR WITH SLIDING-GEAR TRANSMISSION.



A TRIO OF PACKARD 24-HORSEPOWER RUNABOUTS OR "CROSS-COUNTRY CARS" AT THE DETROIT FACTORY.

under construction in the factory of the company. Some of the most interesting details of construction cannot yet be published, being the subject of patent applications now pending in foreign countries, but it can be stated that much of the success of the engine, aside from careful and workmanlike shop methods, lies in the construction of the carbureter. This important organ is so designed that it will furnish a constant mixture at all speeds and the auxiliary air valve usually met with in carbureters of the automatic type has been displaced by a pneumatic device which obviates the familiar flutter of the aspirating valve usually fitted. The carbureter is claimed to be non-flooding and always ready to supply a rich enough mixture for starting without preliminary "tickling."

An interesting feature in connection with the carbureter is the casting of the inlet pipes leading from the carbureter to the valves in the heads of the cylinder, integral with the cylinders and their jackets. These pipes or ducts lead right and left from the carbureter on top of the crankcase, as shown in the engraving of the inlet side of the engine, and then rise perpendicularly through the space between the cylinder walls and water jackets, where the gas mixture is heated before entering the explosion chamber.



A PACIFIC COAST PRODUCT—NEW HEINE-VELOX 35-40-H.P. TOURING CAR.

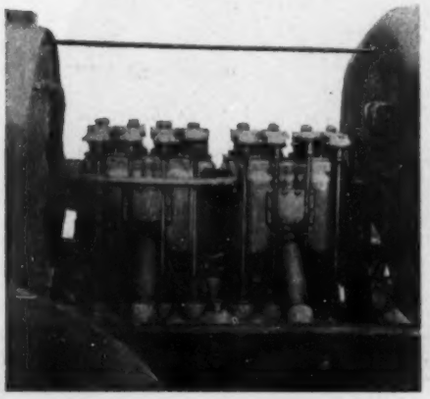
The four 4 3-4 by 5-inch cylinders are cast in pairs and carefully made so that close grained metal only enters into their composition. Valves of generous dimensions are fitted at the top of cylinders, exhausts and inlets being placed side by side longitudinally and operated by vertical push rods and rocker-arms, all actuated by a single camshaft on the exhaust side of the engine. The valves are so designed that they may be removed expeditiously. In cooling, the pump has been suppressed in favor of a carefully planned thermo-syphonic circulation which after an exhaustive test has been found to work satisfactorily.

The piping around the engine is to be commended for its simplicity and the open appearance of the power plant should be conducive to cleanliness and ease of adjustment or repair.

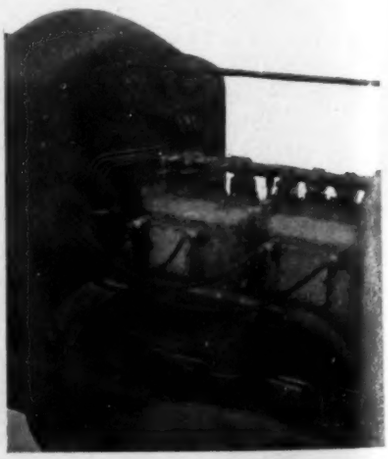
All parts of the car, except the pressed steel frame, will be made in the factory of the company or in San Francisco under the maker's direct supervision. The car illustrated is rated at 35-40 horsepower and weighs less than 2,000 pounds. Of this type about fifty will be built this season. A higher powered car, 50-60 horsepower, will also be turned out in limited number.

Packard 24-H.P. Runabout.

To meet the demand for a high-powered runabout, or, as it is sometimes called, a "cross-country car," the Packard Motor Car Co., of Detroit, Mich., places a runabout body on the regular touring car chassis. The manufacturers state that, notwithstanding the fact that the price is the same as for the regular touring car, the number of runabouts sold has been considerable, exceeding expectations. The engraving shows three of these rakish-looking machines in different positions; these constituted one shipment. As will be noticed, there is a rear seat to which the chauffeur may be relegated on occasion, or which may be occupied by an extra passenger. Under the rear seat is a large storage box. The four-cylinder motor of the Packard car is rated at 24 horsepower; sliding gears give three forward speeds. The runabout on the right of the engraving was exhibited at the Garden show in New York, having been loaned by the owner for the purpose.



EXHAUST SIDE OF HEINE-VELOX MOTOR.



INLET SIDE OF HEINE-VELOX MOTOR.

SARTHE CIRCUIT FOR THE GRAND PRIX.

From Our Own Correspondent.

PARIS, Jan. 17.—The choice of the Sarthe circuit for the Grand Prix race of the Automobile Club of France, gives entire satisfaction here and has created unbounded enthusiasm in the district of Le Mans. All French constructors are unanimous that it is the fastest and best circuit yet discovered, and that it will be the most severe test to which it is possible to put an automobile.

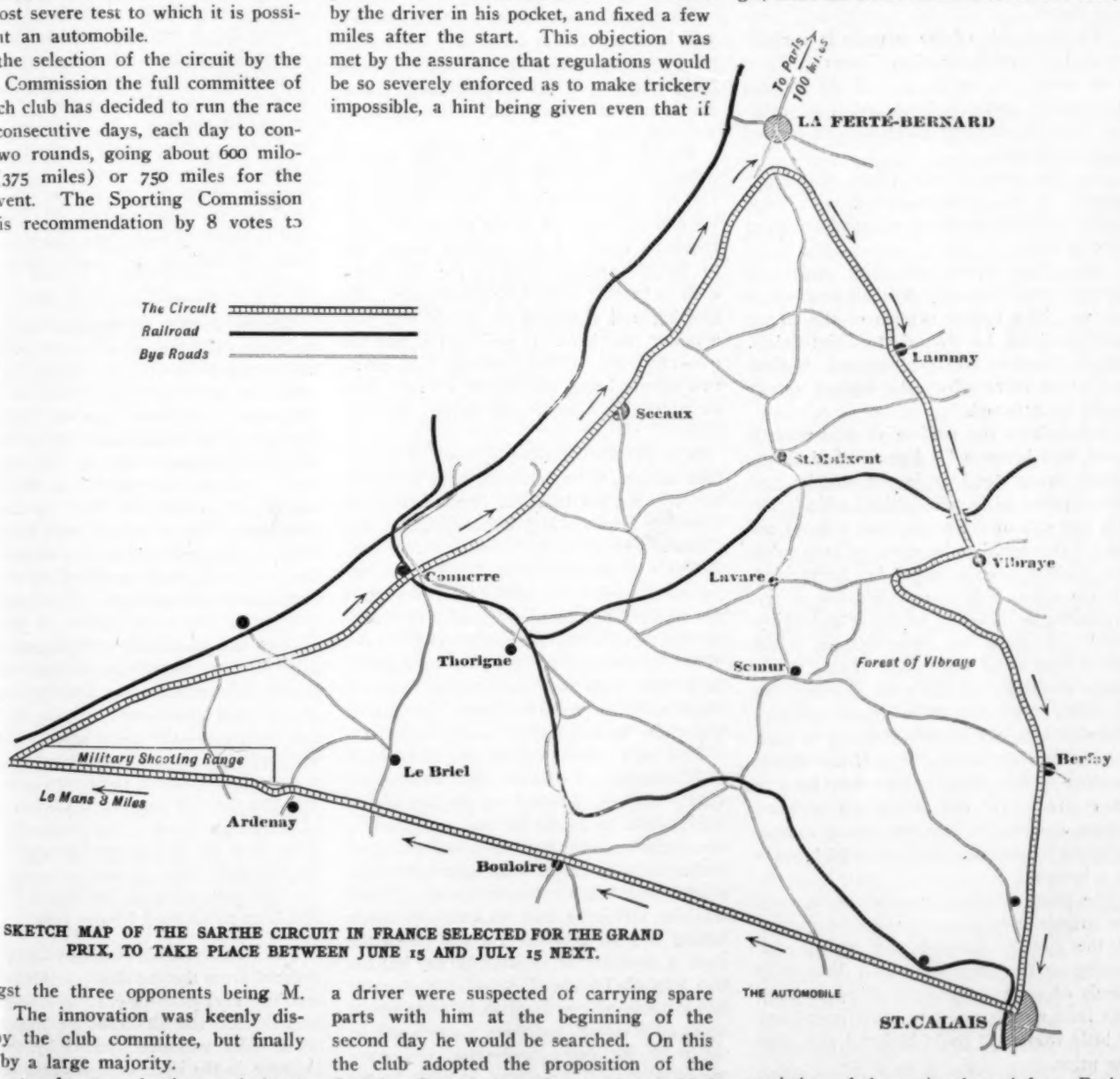
Since the selection of the circuit by the Sporting Commission the full committee of the French club has decided to run the race on two consecutive days, each day to consist of two rounds, going about 600 milometers (375 miles) or 750 miles for the entire event. The Sporting Commission made this recommendation by 8 votes to 3, amongst the three opponents being M. Brasier. The innovation was keenly discussed by the club committee, but finally adopted by a large majority.

Opponents of a two days' race declared that it would be an easy matter for fraud to be practiced, especially during the interval of the opening of the garage on the second day and the sending away of the cars. Immediately on the closing of the first day's race all machines will be put into a specially prepared garage and kept closely under guard until next morning. An interval must necessarily elapse between the opening of the garage and the starting of the last car, and it was during this interval that tricks were feared. Suppose, for instance, it was argued, some minor part of the car gave out, during the night another piece could be obtained—it would even be possible to travel to Paris for it—carried by the driver in his pocket, and fixed a few miles after the start. This objection was met by the assurance that regulations would be so severely enforced as to make trickery impossible, a hint being given even that if a driver were suspected of carrying spare parts with him at the beginning of the second day he would be searched. On this the club adopted the proposition of the Sporting Commission. It was also decided unanimously to allow constructors to change their drivers on the second day, if desired.

As has already been reported, all repairs, changing of tires, filling of tanks and the like must be done by the driver and his mechanic, no other preson being allowed to touch the car from the beginning to the end of the contest, and no private tire or store depots being allowed on the circuit.

The circuit of the Sarthe, is in the form of a triangle, the three sides of which are nearly equal, the total length being 62 miles, 50 of which consist of absolutely straight lines. The first side of the triangle, from La Ferté-Bernard to La Fourche, consisting of the national road from Paris to Nantes, measures 34 kilometers 500 miles. The second side, from La Fourche to Saint-Calais, also a national road, is 34 kilometers long; the third side of the triangle is over the departmental road Saint-Calais to La Ferté-Bernard, measuring 31 kilometers, 500 miles.

The circuit is in the Department of the



SKETCH MAP OF THE SARTHE CIRCUIT IN FRANCE SELECTED FOR THE GRAND PRIX, TO TAKE PLACE BETWEEN JUNE 15 AND JULY 15 NEXT.

Sarthe, the chief town of which is Le Mans, with 70,000 inhabitants, best known to automobilists as the birthplace of Léon Bollée cars, and distant from Paris 132 miles in a southwesterly direction. On the national roads the width from ditch to ditch is from 45 to 52 feet, the actual road being from 22 feet to 32 feet. This width is slightly diminished in three of the villages through which the road passes. The departmental road is not quite so wide, being 36 to 45 feet from ditch to ditch, and 19 to 26 feet actual road, with a slight diminution in two villages. It is seen, however, that the width is ample for cars to pass at any part of the circuit.

The first side of the triangle is variable from La Ferté-Bernard to Connere. From here to the end of the side of the triangle the road is perfectly level, and it is probable that the starting point will be located on this stretch.

On the second side there are slight grades at the commencement, with some rather stiff hills near the end, and the third side is hilly.

Altogether there are fifty miles of straight road and only a small number of curves. The farther portion of the circuit would be from La Fourche to Saint-Calais, where there is an uninterrupted straight run of 22 miles where the highest speeds could be attained.

Everywhere the surface of the road is good, that between La Fourche and Saint-Calais being the best in the district and often spoken of as "the billiard table." On the first side of the angle three villages are passed through, but by erecting barricades, the highest speeds could be maintained. On the second side there is but one village, presenting no difficulty whatever and on the third side there are three villages which would have to be barricaded. There is one grade crossing over the state railroad, but as there are only three trains in each direction it would be no doubt easy to close the line entirely for the day. If this cannot be done a temporary bridge will have to be erected. At one point the railroad crosses the road by a bridge and at another point the road crosses the railroad by means of a bridge.

The point where it is proposed to erect the grandstands is on the fastest portion of the circuit, allowing cars to be seen coming up the road for a long distance at speeds of sixty or seventy miles an hour. The land at this point is uncultivated and of little value and could be hired at a very low price.

Being but three hours by rail from Paris, thirty or forty thousand people could travel from the capital to the grandstands, between midnight and the start of the race, thus bringing a very large income to the club from the stands alone. Le Mans being close by, a large number of builders are available for the construction of the stands or for bridges across the roads and the necessary material can be easily and economically brought to any part of the circuit.

The population of the entire district is very favorably disposed toward automobilism, the aid of the public bodies is already aroused and the town of Le Mans will give a subvention of $20,000 to the automobile club. As in all important French automobile races the entire circuit will be guarded by troops, this being a particularly easy matter in the case of the Sarthe circuit, for the headquarters of the Fourth Army Corps are in the district and can furnish as many men and as much material as is necessary.

Government permission to hold the race will be asked for at once, and as there is no opposition whatever, all the governing bodies of the Sarthe district being enthusiastic over the choice, this will be granted without delay.

The Sarthe circuit will call for quite a different type of car to that required for the last Gordon-Bennett race. There are no difficult hills, no sharp turns, and consequently many of the features which had to be so carefully studied for Auvergne, such as brake power, four speed gears, easy steering and changing of speeds will play a minor part here. It will be the race for powerful cars, efficient cooling, high gears, two speeds being considered efficient, and, an exceedingly important matter, the best tires.

Nine French firms are counted on as certain starters, these being Panhard & Levassor, Brasier, De Dietrich, Renault, Bayard-Clement, Darracq, Hotchkiss, Grégoire, and Gardner-Serpollet, each with three cars. In Paris automobile circles Lytle and Dingley on Pope-Toledo cars and Tracy on a Locomobile, are counted on as very probable starters; whilst a third Pope-Toledo, a White and a Christie, are half expected to be present. At this early stage, however, these may be regarded more as entries hoped for than as certain starters.

This year speed will be the factor, and the fastest possible circuit that France can supply has been selected for the first Grand Prix. The race will be one straightaway run from beginning to send, without controls, without grade crossings, and over roads permitting the fastest speeds. There will be no more tire experts or repair teams, and the moment a car is given the start it must not be touched by any but the two men on board. Oil, water, and gasoline stations will be fixed at different points around the circuit, but these stations will be the same for every competitor, and commissionaires will be placed at each to see that the regulation forbidding outsiders to touch the cars is strictly carried out. It is, in fact, a return to the early days of racing, when the competitors were sent away with a reserve set of tires and had to reach home unaided.

The change will be likely to effect some of the teams, for, as is well known, some very clever men at the steering wheel are but indifferent at tire-changing and mechanical repairs. Incidentally, also, it will decrease the expenses of foreign competitors; instead of the team of about thirty men which came over from the States with the three American cars entered in the Bennett race of last year, but two men for each car will be required under the new conditions. The saving will be appreciable where men have to be sent 3,000 miles and kept in a foreign country for at least two months.

The date of the race has not yet been decided upon, all that is known being that it will be between June 15 and July 15.

It is proposed to start the cars on the second day in the order and at the hour in which they finish the first day's run. Thus, if the first car finished at 4.30 p.m. on the first day, it would be started at 4.30 a.m. on the second day. As there are no neutralizations, this would simplify calculations, it being only necessary to take the hour at which the car started on the first day and its finishing time on the second day to have its exact running time. This, however, has not yet been considered officially.

Three French companies engaged in building small cars have been disciplined by the Automobile Club of France for advertising the performances of their cars in the December voiturette contest which was brought to an unfortunate end by innumerable tire punctures due to nails sprinkled on the course. As reported at the time, the award of prizes was held up until two meetings of the jury had been held to discuss whether the nail-strewn section of the course should be neutralized or should be included in the contest. The jury finally decided to retain the whole course, and a Vulpes car gained first place, and the De Dion-Bouton house gained the regularity prize. The matter was finally referred to the touring commission of the A. C. F., which annulled the entire event. Meantime the winning firms had advertised the respective performances of their cars extensively. For this the club suspended Lacoste & Battmann for six months and imposed a fine of $200, fined the Vulpes firm $20 and De Dion-Bouton $20. Not all persons consider the decision just, since the results of the event had been announced by the jury.

The Pennsylvania Railroad Company has ordered from the car shops at Altoona, Pa., 100 box cars of a new style, designed especially for the shipment of automobiles. This order was necessitated by the great increase in the shipments of autos last year and the constant complaints of patrons that the cars were not suitable for such service. The new cars will be ready for use by May or June.

The first automobile ever seen in the Philippines by the Igorrotes was taken to Bangio by Major Edwin B. Babbitt, of the Ordnance Corps. The natives were given a genuine scare.

THE AUTOMOBILE IN AMERICA.*

By FRANK A. MUNSEY.

FACTS and figures about the beginning and progress of the automobile industry are so conflicting, and there is such a dearth of accurate knowledge on the subject, that I cannot show, year by year, our growth in the manufacture of automobiles. The best obtainable statistics show that our output for 1905 has been about twenty-five thousand cars of one kind and another. These figures, contrasted with those of half a dozen years ago, show the most tremendous strides of the automobile industry in America. Then but very little capital was invested in automobile factories; now over twenty millions of dollars are employed in the business. Then we had but two or three small manufactories, merely experimental shops; to-day we have forty or fifty great big factories amply equipped with money and machinery and skilled workmen, and we have at the head of these factories both men of splendid executive force and those of scientific knowledge, who are bending every thought and every energy to the development of the best automobile in the world, and to its production at the least possible cost. It is in the latter respect that American ingenuity and American methods most forcefully assert themselves. This means that the American automobile will at no distant day dominate the markets of the world.

Until recently the automobile was looked upon as a plaything for the very rich and a fad of the hour. But that it is beginning to be taken seriously is made clear by the fact that in New York State alone we now have registered over twenty-four thousand motor cars. Just how many there are in the whole United States I have been unable to learn, but with twenty-four thousand in one State of the Union, there must be as many as one hundred thousand now in use. The uncertain period of the automobile is past. It is no longer a theme for jokers, and rarely do we hear the derisive expression, "Get a horse!"

We are not only going to manufacture the best automobiles in the world, but we are already making pretty nearly, if not actually, as high-grade machines as are produced anywhere in Europe. That the European machine has the prestige cannot be denied. It made a place for itself before we even started to manufacture automobiles, and it is difficult to overcome prestige. There is something else that works immeasurably to the advantage of the foreign car and correspondingly to our disadvantage. It is the great army of Americans who go abroad every summer and automobile there in foreign cars. They become accustomed to them, attached to them, and bring them home. The power of habit has its grasp, in automobiling as in everything else. The fact that So-and-so and So-and-so have foreign cars has an undoubted influence on other Americans in the purchase of automobiles.

American and Foreign Cars.

But all these influences will not be able to stand against the genuine excellence of the American car of to-day with its lower price. The duty on a car coming into America is forty-five per cent. and with the expense of casing for shipment, freight, and insurance, we have a total of fifty per cent., which must be added to the purchase price of a car in France. This means that one can buy an American car of the same horsepower, finish, and general excellence as a foreign car at just about half the price, or, in other words, get two American cars for what one foreign car would cost. With so wide a margin of difference in cost, it is not difficult to foresee a rapid diminution in the importation of automobiles as the quality of our own product becomes better known and is further improved.

Though we were the last country to take up seriously the manufacture of automobiles, we are to-day turning out even more cars than France. Her product, however, is of greater value than our own, as the average French machine is much more expensive. Our great expansion so far has been in inexpensive automobiles, and there is a very sound reason for this type of machine. In France, as in England and Germany and Italy and Spain, there is not the vast well-to-do citizenship that we have in America. The automobile over there is largely owned by the very rich and the great leisure class—by these and by foreign visitors. Comparatively few men in business or in salaried positions indulge in the luxury of motoring. Their incomes do not warrant it. The motorcycle and the bicycle are the pleasure machines of the people.

Our Lighter and Simpler Machines.

In America we have half a million men who can afford to own and run an automobile, and half a million automobiles we shall have in use here within the next ten years. Our manufacturers, realizing the difference in conditions between this country and the countries of Europe—the difference in the roads, and in the wealth and temperament of the peoples—are very wisely making automobiles that are particularly suited to America. Over eighty per cent. of them, I should fancy, are so simplified that they are independent of the mechanism. They are chauffeurless machines, machines for the half million citizens, many of whom could not afford to maintain an automobile plus the additional expense of a mechanician.

The salary paid to a chauffeur in America has an important bearing on this point. Chauffeurs' wages here are anywhere from seventy-five to one hundred and fifty dollars a month, whereas abroad the average price is about forty dollars a month. Most men, however, prefer driving their own automobiles, whether they have a chauffeur or not. It is in the running of a car, the handling of it, the feeling of command over it, and its obedience to one's will, that the keenest enjoyment of automobiling is found. Delightful as it is to be driven with the speed of the toboggan in a good car over a fine, smooth road, it is far more delightful to be at the wheel.

In hilly or mountainous sections, where "thank-you-ma'ams" are thrown across the road every few rods, ours are the only cars in which automobiling is practicable. I use the word "thank-you-ma'ams" for the want of a better expression—I mean elevations like a log half sunk into the roadbed and covered over with earth. This construction in our rude and imperfect road-building is, I believe, intended to keep the road from washing away in heavy rainstorms. It doubtless serves the purpose, but for the automobile, and particularly the low-hanging automobile of Europe, it means serious trouble, if not actual destruction.

In a run with a friend from Newburgh to New York last summer, I had a striking example of the adaptability of our light domestic cars to our rough highways. To my very great surprise we covered the distance, about sixty-five miles, in slightly less time than I had ever taken in going over it in high-priced, high-power cars. I was thoroughly familiar with the road, as I have automobiled over it many times and in a variety of cars, including a sixty-horsepower Mercedes, which I owned in 1903, and which I found to be wholly unpractical and unsatisfactory for use on our roads.

The secret of my friend's good record was that he kept his car running all the while at pretty nearly full speed. He did not stop for rough places. It was not necessary. The car was made for just such roads, and

*From an article appearing in *The Munsey*, January, 1906. Reproduced by special permission.

was at home on them. On the other hand, with high-priced, high-power cars, one always favors them by going slowly and carefully over rocks and hubbles and hummocks, and through mud and sand. On clean, level stretches the big car can fly, but with the restrictions of the law and the scarcity of good stretches of road, it cannot make up what the little car gains on it on the great preponderance of bad stretches.

THE BEST MACHINE FOR TOURING.

Another important advantage with the small car, in addition to the fact that it actually needs no chauffeur, is that in wear and tear, and in the use of gasoline and oils, the expense is minimized. It is probably less than one-half that of a forty-horsepower automobile. And in speaking of small cars, I am not going back to the period of seven and ten and twelve horsepower cars. I mean cars of from eighteen to twenty-five horsepower. Nearly three years ago I made the statement in *Munsey's Magazine* that a twenty-five horsepower automobile was the ideal machine for general touring. At that time I did not know so much about automobiling as I do now, but the experience I had had convinced me that this was a practical, economical, and yet sufficiently powerful car for any purpose.

What I said then, based on two or three years of experience and a good deal of theory, I say now as a matter of absolute certainty. A twenty-five horsepower car is strong enough, if not over-weighted by an excessively heavy body, to climb up the side of a house. It can travel as fast as any one could reasonably wish to go, and much faster than the law allows, and it is safer, more easily handled, and more satisfactory in every sense. I have had automobiles ranging all the way from five horsepower to sixty, including two forties, and the machine that has given me most satisfaction is a light car that makes up to about twenty-five or possibly twenty-eight horsepower. It is alike a good short distance and good long distance car—a car that tackles a hill with the will and the nerve of a bulldog, and when gentleness is required is as gentle as a lamb.

OUR URGENT NEED OF GOOD ROADS.

In one respect the automobile is doing more for us than it is for France. It is giving us good roads—not, of course, directly giving them to us, but it is the greatest force working for them that has ever taken shape. Every one who tastes the pleasures of automobiling at once becomes an uncompromising advocate of good roads.

France had her good roads before the advent of the automobile, and because of her good roads receives in the aggregate, through the automobile, a tremendous annual income for her people.

Much as this means to our sister republic, however, I am certain that America is being benefited even more, vastly more, through the influence of the automobile. While we are not yet drawing foreigners to our shores to spend their holidays, as France is, we are nevertheless marvelously increasing the worth of our enormous acreage throughout the length and breadth of the land, by the good roads we are building and those scheduled to be built.

Give us fine, broad macadam roads everywhere, and our farm lands and the suburbs of cities and villages, stretching out even to a great distance, will bound in values. Good roads eliminate distance and make neighbors of us all. So do automobiles, like railways, the telegraph and telephone, eliminate distance. Combined, they enlarge the scope of the city by a hundred miles, giving us city comforts and conveniences with the pure air and sunlight and space and freedom of the country.

THE GRADUAL PASSING OF PREJUDICE.

The automobile has arrived. It has met the bitterest prejudices and the most deadly scoffing, and come up against stubborn and narrow laws, but in spite of these it has been developed and perfected and has triumphed. Already it has been absorbed into our civilization, even as the trolley, the electric light, and every other luxury that so rapidly crystallizes into a necessity.

With the recognition that the automobile has come to stay, prejudice generally is giving way to toleration and to reason. It is no longer war between the motor car and the horse. Harmony between them is the keynote of the new order of things. It is getting to be felt, too, that after all there are some pretty decent and really thoughtful, humane men among automobilists. And this feeling helps—helps very much. Such a feeling, with a better understanding of the automobile, means better and more rational laws, more elastic laws, legislation that will suit the motor car—not the kind that is based on the performance of the horse. It were well nigh as sensible to make railway laws to conform to the scope of the horse as to hold the automobile down to the hard and fast limits allowed that ancient and erratic quadruped.

As an automobilist myself, and one who is a strong advocate of motoring, both for health and pleasure, I am nevertheless unalterably opposed to the enactment of any laws that would work to the advantage of the automobilist and to the disadvantage of the public. The public should be considered first always, and then be fair and rational with the automobilist.

For example, if an automobile going at the rate of twenty miles an hour can be stopped in half the distance it would require to stop a horse traveling eight miles an hour, isn't the automobile clearly less dangerous to the public, even though moving at the greater speed, than the horse is at the lesser? If this is so, why should the horse be accepted as the standard of measurement of the speed of the automobile in and about cities and villages?

It were foolish to assume that the automobile by nature and temperament and habits is a thing to endear itself to the non-automobiling public. It has such decided mannerisms, and is withal so strenuous in action, that it strikes a jarring note with the American citizen. Its impudent air of superiority as it dashes by one on the road, its insolent toot of the horn, commanding the right of way, and the blinding, stifling cloud of dust that it leaves behind it are undeniably antagonistic to the ideas and viewpoints to which we have been accustomed. Whatever laws and regulations will tend to bring the motor car and the interests and rights of the general public into the greatest harmony will, I am sure, meet with approval from the manufacturers of automobiles and all true lovers of automobiling.

TO REMEDY THE DUST NUISANCE.

It is certain that the dust nuisance is one of the very worst and most objectionable phases of motoring to all the people in the country. It is not only objectionable to non-automobilists, but to automobilists themselves. It has often been urged that the automobile should have special roads, and should be ruled off the public highways. Do this, and it ceases to be anything except a high-speed pleasure machine—a sort of horizontal toboggan, and as such it would soon dwindle into a very insignificant place among the inventions that have contributed so wonderfully to our present-day civilization, our present-day scope of living and doing and enjoying.

To make the automobile subservient to existing conditions, to develop it so that danger from its use will be minimized, and that the dust nuisance will be largely done away with, is the result we must strive for and must attain. And whatever will help to bring this about should enlist the thought and the best efforts of automobile manufacturers and our lawmakers. I have done a good deal of thinking at odd times along this line, with the following result:

A PRACTICAL SUGGESTION.

Why not limit the power of automobiles that have the privilege of the public roads, and in addition elevate their bodies to say twelve, fifteen, or eighteen inches from the ground? With the machine of smaller power, danger is greatly decreased, and with the high car the dust nuisance would be very much less. It is the car of great power, with low-hanging body, that tears up the surface of the road and sends it flying in dense clouds of dust over everything and everybody.

The low-hanging car is necessary only to great speed. It does not capsize so easily at corners and on curves. But is the public interested in fast automobiling on the general highways, and should it be subjected to such inconvenience and danger? That well-elevated cars could have ample safety with thoughtful and intelligent handling there can be no doubt.

I am inclined to predict that the time will come when the low-hanging car of to-day will be ruled off the public roads and relegated to the race-track. I am inclined to predict, too, that there must sooner or later be a limit placed on the power of automobiles for use on the highways. If not, where shall we stop—at sixty, ninety, a hundred and twenty horsepower, or even more? It seems to me that twenty-five horsepower, for a light body, a light machine throughout, is pretty close to a good standard of measurement. Heavy bodies could still be increased in horsepower proportionately to their weight.

NEED OF STATE INSPECTION.

One thing more in connection with lawmaking for the automobile. It is important—tremendously important—that the State should have inspectors of automobiles, whose duty it should be to see that all motor cars are in safe mechanical condition—that they are amply equipped with brakes, and that these brakes are in perfect order. The most important thing about an automobile—more important even than the engine or anything else—is the brake. On this depends the lives and the safety both of those on the car and of the public.

An automobile should be equipped with sufficient brake-power to make certain, at all times and under all conditions, that the car should be stopped almost instantly. Two brakes are not enough. Four are not too many, and half a dozen of different kinds and methods of application would be better yet. A relay of brakes is always necessary, as it may happen at any time that a single brake, or even two, would refuse to work. Oil renders them useless for the time, and too frequently cars go out with brakes that are worn, or even broken. State inspectors, serious, honest, intelligent men, would save many human lives every year and show a tremendous reduction in the number of accidents.

The framing of laws that regulate and tend to prevent danger is quite as important to the public as are those hard and fast statutes that penalize the automobilist and drag him off to jail if he happens to run his car a bit faster than the law permits. It would be well if our lawmakers would first learn what an automobile can do and ought to do, before saying what it shall do and what it shall not do.

A disabled car, belonging to a Philadelphian, Frank Starbuck, the old long-distance bicycle racer, was recently held up in Camden for not having a New Jersey tag displayed. The "dead" car was being towed from West Philadelphia to Riverton for repairs. Recorder Stackhouse ruled that a broken-down automobile was an automobile still, and, refusing to stand for the nice legal distinctions advanced by the occupant of the "live" car, mulcted him in $25 for dallying with the automobile ordinance.

Letter Box

Patents on Two-Cycle Engines.

Editor THE AUTOMOBILE:

[300.]—We notice that not less than four different people are claiming patents covering two-cycle engines. These patents seem to be of varying dates from 1892 up nearer to the present time.

Will you please answer through your columns whether or not the two-cycle engine was not the first gas engine made, and whether or not they were made prior to 1892?

Some information along this line would greatly interest a number of your readers.

Detroit. F. T.

We shall be pleased to receive replies to the foregoing questions from other readers who may have made investigations into the subject.—ED.

Not Using Day Two-Cycle Type.

Editor THE AUTOMOBILE:

[301.]—In connection with the recent announcement in regard to the Day patent on two-cycle engines, covering the three-port type of construction, we wish to state that the Libby engine used in our product for some time past, and which will also be used by the Knox Motor Truck Company, of Springfield, Mass., the coming season, is not of this type, inasmuch as the gas is admitted to the crank chamber through an automatic valve—that is to say, through a spring closed check valve.

SUNSET AUTOMOBILE CO.,
D. Libby, Jr., Mgr.

San Francisco, Cal.

Best Route to Princeton and Trenton.

Editor THE AUTOMOBILE:

[302.]—Since reading the very interesting article in THE AUTOMOBILE of December 28, entitled "Short Drives in New Jersey," I have been expecting a communication from some one to appear, advising that the last paragraph is incorrect. It would seem, however, that for the benefit of automobilists passing this way I will have to write it myself.

There is not a continuous macadam road from New Brunswick to Princeton by way of Franklin Park, as the newly-laid pavement ends at that point; the rest of the way, from Franklin Park to Kingston, may have seemed like macadam in passing over it, as all the country roads were good during the protracted dry weather last fall. Personally I was quite sure that nothing had been done to this stretch of road, but I took the precaution to inquire of a motoring resident of Franklin Park if anything had been done to the road beyond his place. He informed me that there had not, and stated further that that section of road not only is bad now, but was really the worst originally.

The better way to go from New Brunswick to Trenton or Princeton, therefore, continues to be by way of the Cranbury Turnpike through Deans, Dayton, Cranbury, Hightstown, and Windsor, to Edinburg, whence one goes straight ahead to Princeton, or turns 90 degrees left to Trenton.

I hope that this information may be of value in preventing some of your readers from taking the Princeton route to Trenton just now when no road is any too good. LOUIS H. VOORHEES.

New Brunswick, N. J.

Differentiation of Roads on Government Geological Survey Maps.

Editor THE AUTOMOBILE:

[303.]—I beg to hand you copies of replies received from Messrs. Brownlow and Walcott relating to the subject of differentiating on the government topographic maps the improved hard roads and the ordinary dirt roads of the country, which was treated in my letter to Mr. Walcott of the United States Geological Survey which you recently published.

Mr. R. D. Chapin is having the matter brought up by Mr. Ivins, the publicity representative of the National Association of Automobile Manufacturers, and the American Automobile Association, in Washington.

AUGUSTUS POST.

New York City.

Mr. Augustus Post:

Your letter with inclosures received. I have taken the matter up with Mr. Walcott and hope to be able to advise you fully within a few days. I assure you that I will be glad to co-operate with the Department and your association fully in the matter.

W. P. BROWNLOW.

Mr. Augustus Post:

In reply to yours of December 22, 1905, requesting that this survey differentiate on our topographic maps between earth and stone roads:

I am glad to have you bring this matter to my attention in the form it has reached me. This is a subject which has been considered here from time to time. The distinction is one which should be made, providing it can be done without overloading our maps with information. It is one which the department can readily make in the field. I agree with your statement about the permanency of stone roads as compared with farmhouses, second-class roads, etc. The mechanical difficulties of representing this feature on our maps are much greater than would appear on the surface.

I will have this matter taken up anew with a view to securing some practical means of accomplishing the end desired in

such manner as will not confuse the other features shown on the sheets.

CHAS. D. WALCOTT,
Director U. S. Geolcgic Survey.
Washington, D C.

Hon. Wm. P. Brownlow:

Your letter of January 3, with copy of letter from Mr. Augustus Post, received.

The matter referred to, the distinction of classes of roads, is now under consideration, and I anticipate that an appropriate symbol will soon be determined upon which will indicate, on all new maps, the distinction between macadamized or paved roads and dirt roads. I am heartly in accord with the views of Mr. Post and the American Automobile Association, and have referred the matter to the committee on Map Editing with a view to having it recommend some appropriate symbol.

CHARLES WALCOTT.
Washington, D. C.

Solid Foundation of Components Trade.

Editor THE AUTOMOBILE:

[304.]—One of the interesting conditions that strikes an observer in the progress of the automobile industry is the maturity of judgment on the part of manufacturers, as compared with that displayed at the same stage of the bicycle industry in which, perhaps, the most conspicuous economic feature was the over-investment in productive capacity. Except in those cases in which the manufacturer found himself already in possession of a plant of great productive capacity, there has been a general tendency to keep productive investments at a minimum, or at least at a point which but slightly exceeds the minimum requirements of possibly fluctuating trade; in short, to keep productive investment at a point which cannot, in ordinary human probability, be a burden at any time in the vicissitudes of trade.

Another highly interesting engineering condition lies in the discovery, some time ago, that in all respects, except the engine itself, American design was conspicuously better than foreign, as a result of which we find a tendency on the part of automobile designers to concentrate on the engine, with the result that the average of our best cars is now at least as good as the best in the world.

These conditions could have been and were foreseen by many observers in the initiation of the industry, and have resulted in the availability of component parts suitable for cars of howsoever high a grade and price, affording a conspicuous relief to many designers who wish to concentrate their attention upon the perfection of their motive power.

The experience of the last two years has also effectively disposed of the thoughtless analogies which some observers attempted to draw between the automobile and bicycle component parts business. There is no analogy, and never has been. The bicycle component parts business, at least in this country, pandered essentially to the cheapest trade and depended to no small degree for its existence upon the cross-roads manufacturer or speculative semi-manufacturing jobber.

The engineering obstacles alone would operate strongly against a similar condition in the automobile trade, and the productive capacity of the five or six principal component parts producers of this country is practically devoted entirely to contributing in the production of the cars of already well-established and prosperous concerns occupying not only important but conspicuous places in the trade to-day. In fact, the curtailment or embarrassment of any one of these concerns would be a serious embarrassment to some of the most prosperous and conspicuous motor car manufacturers of all kinds of affiliations. Happily, the well-established and substantial character of both the business and the plants of these concerns puts such a contingency beyond human probability, and the automobile component parts business to-day, instead of contributing to the extension of competition, is, as might have been predicted by any competent automobile commercial engineer, one of the greatest conveniences and economies available to the motor car producer, whose prosperity makes such a resource desirable.

HAYDEN EAMES.
Cleveland, O.

The Best Anti-Freezing Solution?

Editor THE AUTOMOBILE:

[305.]—I have been reading in your magazine for about a year and I haven't seen anything in it yet as to what is the best thing to use in a water-cooled motor in the winter time in order to keep it from freezing. I have been advised to use all kinds of things—some say alcohol, others say glycerine, kerosene, calcium chloride, and other things. The question naturally presents itself, Which is the best to use? Is there any danger of alcohol catching fire.

I should like to have some information on the subject. J. L. GATES.
Charleston, W. Va.

Letters on the subject of the use of wood alcohol in the cooling system were published on page 740 of the issue of April 8, 1905, one giving the experience of Mr. Bowen, of Buffalo, who found a solution of four quarts of wood alcohol to ten quarts of water very satisfactory at a temperature of 15 degrees above zero (the lowest he had an opportunity to observe). He found it necessary to wire a piece of rubber tubing to the overflow pipe and bring the free end of the hose close to his foot, where he could watch it, closing the end with a cork not too tightly fitted, so that it could be forced out by a little pressure.

A number of anti-freezing solution formulas were given in the Letter Box department in the fall of 1904, especially in the October 29 issue. A correspondent living in Winnipeg told of an experience with a solution composed of 60 per cent. glycerine and 40 per cent. water that did not freeze, notwithstanding the winter of 1903 was the coldest that had been experienced in western Canada, where the temperature falls as low as 40 below zero. The only drawback to its use was the fact that the acids always present in commercial glycerine affected the tanks and coils, eating into the surfaces and weakening them considerably. In a warmer climate this objection would not be so great, since a much smaller proportion of glycerine could be used.

The material most commonly used, however, is a solution of calcium chloride in water, the density depending on the temperature to be resisted. A mixture of three pounds of chloride to one gallon of water will freeze at about zero Fahrenheit, while a mixture of four pounds to a gallon will free at about 20 degrees below zero. Commercially pure calcium chloride should be secured and care should be taken not to get chloride of lime instead, as the latter is very corrosive to iron and steel.

Readers who have had considerable experience with anti-freezing solutions during the winter of 1904—5 and the present winter are invited to tell of their experiences for the benefit of others.

ANALYSES OF AMERICAN MOTORS.

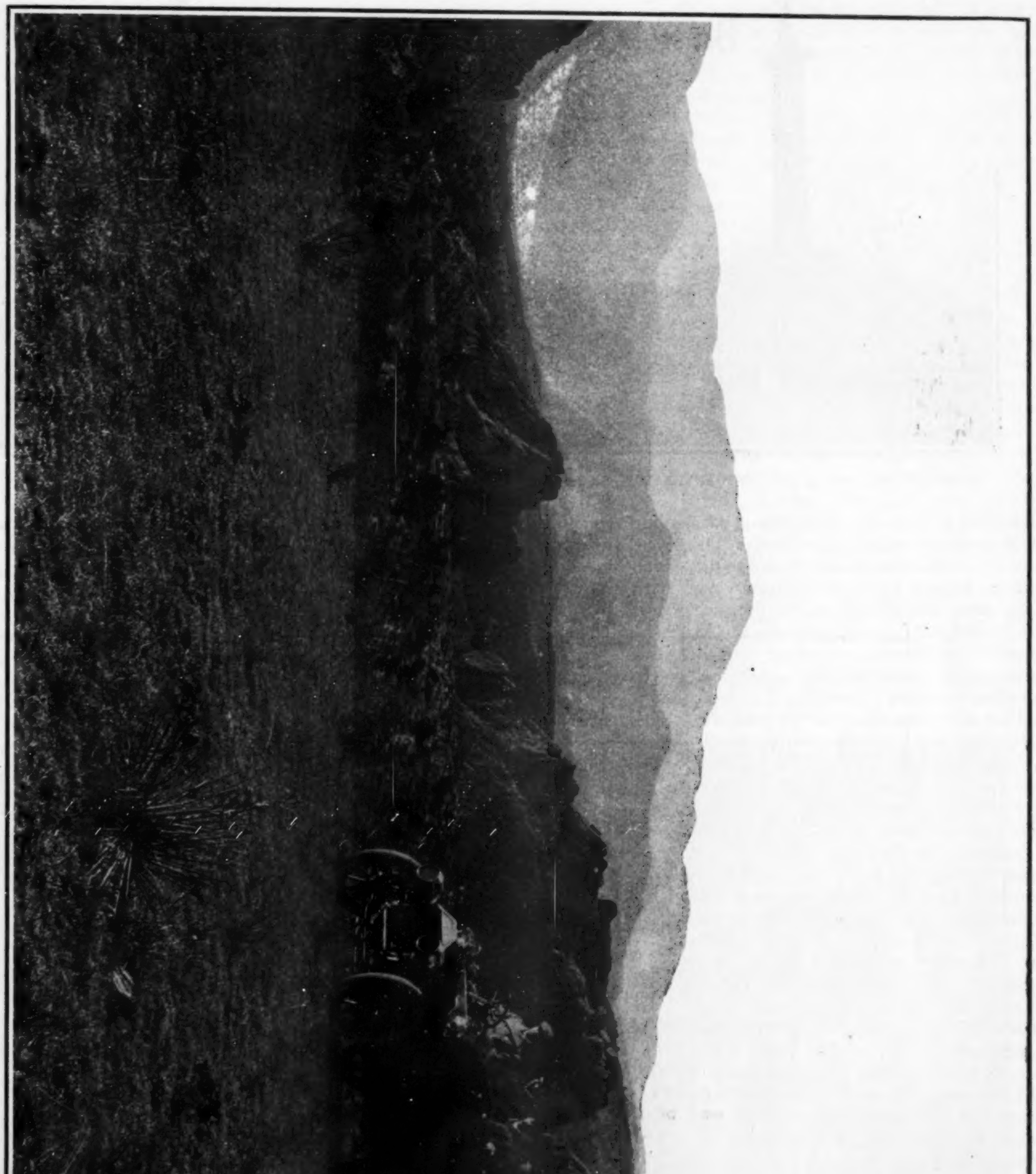
(*Continued from page 296.*)

the system of exhaust pressure-feed and the crankcase compression-feed following it closely. While an oil circluating pump is also in evidence on some of the higher-priced cars, splash lubricating and gravity feed are relegated to the background. The percentages of the different systems are:

	Per Cent.
Mechanical lubrication	.50
Exhaust pressure or crankcase pressure feed	.30
Circulating pumps	.10
Automatic or gravity feed	.10

Some form of automatic carbureter is installed on practically all the cars shown, the devices taking different shapes according to the fancy of the designer, but the principle of automatic carburetion is generally recognized and carried out. One of the surprises of the show, however, was the fact that only about 10 per cent. of the motors are fitted with governors acting in connection with the clutch, so that the motor is kept at a uniform speed when the clutch is withdrawn. Many of the chassis are shown in an incomplete condition, so that the accurate tabulation of this feature is impossible.

These percentages do not correspond to the percentages of the foreign shows, and seem to indicate that our designers are striking out for themselves and developing the motor according to the requirements of the country, rather than slavishly following foreign practice.



ON THE MESA.

WITH A PEERLESS TOURING CAR IN THE GARDEN OF THE GODS, COLORADO. ENTRANCE TO THE GARDEN IN THE MIDDLE DISTANCE AND PIKE'S PEAK (14,108 FEET) IN THE BACKGROUND. A FAVORITE TRIP WITH DENVER, COLORADO SPRINGS AND MANITOU AUTOISTS.

Brussels Show Reveals Progress of Belgian Industry.

VIEW OF THE PALAIS DU CINQUANTENAIRE, BRUSSELS, WHERE THE BELGIAN NATIONAL SHOW OPENED ON JANUARY 13.

BRUSSELS, Jan. 17.—The fifth annual Brussels automobile show, held in the Palais du Cinquantenaire, was opened to the public on January 13, after a private view for the press and officials on the previous day. Unlike what usually happens at big automobile exhibitions, everything was in readiness on the varnishing day—stands and decorations complete, exhibits all in position—and the only thing that was late being the electric lighting in one portion of the building. After an elaborate banquet, followed by the usual speechmaking and good wishes, real business was entered upon in earnest.

Last year the Palais was quite sufficient for the needs of the show; this year the increase has been so great that cycles and motorcycles have had to be placed in the basement, leaving the main hall, with 14,000 square meters of space, free for automobiles. Following the lead of Paris, the decorations of the stands and of the Palais have been made more elaborate than ever, the building in which the show is held being well adapted for artistic decoration. A post-office, a telegraph office and telephone booths are installed within the building, and a special service of automobile 'buses unites the show with the center of Brussels.

French makers are the most largely represented among foreign firms, thirty-two French constructors having handsome stands under their own control in addition to the firms represented by their Belgian agents.

The most important feature of the show is the notable advance which has been made by the Belgian industry, both in quantity and quality of goods shown, Pipe, Minerva, Germain, Vivinus, La Métallurgique and the Auto-Mixte concerns having all large stands and excellent exhibits. Good workmanship is shown in bodies, the proportion of limousines being remarkably large, and, though they have not yet attained the elegance of French bodies, they show a great improvement. Small runabouts are rare at the show, although Belgian motorcycles are well represented. This deficiency is accounted for largely by the difficulty that native constructors still have in turning out small cars at a low price. Commercial vehicles, on the other hand, are well represented.

Italy is represented at the show by the Fiat and Itala; Germany sends the Mercedes and N. A. G. cars, and England is meagerly represented by Humber and Beeston automobiles.

Foreign News Notes.

A somewhat extensive series of technical competitions is under consideration by the Automobile Club of France. Prince Pierre d'Arenberg asks for a competition for speed and distance indicators, for which a prize of $200 has been offered by Baron Henri de Rothschild. Experiments are being made by the technical commission on velocity and braking powers, and very shortly comparative tests of change-speed gears will be carried out at the A. C. F. laboratory. A spring wheel competition is also under consideration, the regulations for which may be announced shortly.

To celebrate the tenth anniversary of the founding of the Automobile Club of France a dinner has been arranged at which will be present all the founders of the club who were present at a similar dinner just ten years ago. It is intended to make the banquet identical in every respect to the first one held by the club, and the menu, a copy of which has been discovered, will be followed in every detail. One difficulty has already occurred. At the first dinner a certain fish was eaten which can be caught only in the Volga. Orders have been sent for the same fish to be supplied, but as the Volga is now frozen the execution of the command may be a difficult matter.

Much annoyance has been caused in English steam car circles by the appearance of the Tourist Trophy contest rules for 1906, which permit to steam and gasoline cars alike one gallon of fuel for every twenty-five miles traveled. It was at first intended to give the steamers an allowance which would give them a fair chance—about a gallon to every sixteen miles—but some pressure must have been exerted to overrule these intentions.

Four automobiles, three destined for heavy work and one for passenger service, are going out to Germany's colonies in Southwest Africa next month for use in the field, as the Herrero war is by no means settled. These will be the first military cars used in the German colonies.

The motor omnibus question in London is attracting much attention, and the London county council begins to fear the great competition arising to its tramways. A tentative demand has been made to rate the automobile 'buses and limit their routes by legislation. This would be a decided unfairness, but the proposal is interesting as showing how the automobile conquers wherever it enters.

Statistics have just been published on the automobile industry in Italy which show a marvelous increase both in imports and exports since the year 1900, in which year 199 cars of the value of $240,800 were imported into Italy. For 1901 the figures were 298 automobiles, valued at $468,200; in 1902, 276 cars, at $429,800; 1903, 297 of the value of $561,200; 1904, 410 cars, aggregating 822,000, and in 1905, 688 cars, valued at $1,249,800. The export figures show that the increase has been in much greater proportion. Starting in 1900 with 6 automobiles, valued at $7,200, the number rose in 1901 to 20 cars, of the value of $20,400; in 1902 it was 30 cars, aggregating $34,000; in 1903, 52 cars, valued at $116,000; 1904 gave 127, at $222,400, and in 1905 the record was broken with 257 automobiles, of the total value of $556,800.

TWO-CYCLE AND FOUR-CYCLE.

(*Concluded from page 299.*)

A two-cycle engine built on the general lines here indicated will develop from 50 to 60 per cent. more power than a four-cycle of the same size will. The charge is not quite as pure as the full charge of a four-cycle, as is indicated by its not giving 100 per cent. more power, and it will require a stronger spark to ignite the mixture; but on the whole, taking mechanical troubles of a four-cycle, and everything into consideration, the two-cycle will probably cause less trouble and annoyance than the four-cycle engine. There is room for differences of opinion on this point, however, the fact that it is not as precise in the all-important function of cleaning out the exhaust leaves it open to question to a certain degree, and we will not have an ideal two-cycle engine until we get one that at least equals the four-cycle in that respect, and when it does, it will develop at least 100 per cent. more power than a four-cycle of the same size.

Many Attacking the Problem.

The writer believes that the efforts now being put forth will accomplish this desirable result within the next year or two, for many of our ablest engineers are now working along this line. A future article will treat in a large measure of a review of various methods, so far as known, along which different investigators are now working. It is to be hoped that some one will succeed in devising a simple method of removing all of the exhaust gases from the cylinder of the two-cycle motor—at least as nearly all as they are now removed from the cylinder in motors of the six-cycle type. Such an engine will be as much of an advance in reliability and satisfactory performance over the four-cycle type as the best four-cycle is an advance over the two-cycle motor of ten years ago.

CHICAGO 24-HOUR TEAM RACE.

Chicago, Jan. 29.—It is probable that a twenty-four-hour automobile contest will be held at Washington Park track on Decoration Day, as five prominent teams have signified their intention of participating. W. H. Pickens, manager of Barney Oldfield, is making the negotiations for the meet, and is confident that the famous track can be secured for the purpose. If, however, this property should be subdivided in the meantime, the race will be held at the Harlem racetrack.

The teams which have promised to compete are the Soules brothers, in a Pope-Toledo; Cooper and Oldfield, in a Peerless; Coey and Nipper, in a Thomas; Clemens and Nietz, in a National; and Ellis and Sampson, in a Frayer-Miller.

Cars of 50 horsepower and under are eligible to compete. It is planned to start the race at 3 p.m. on May 29 and end it at the same time the following day. A system of lighting will be used in which the light will be thrown ahead of the driver on the track, the lights being fastened on the fences and shaded.

Jerome Ellis, who is a director of the Chicago Automobile Club, is a prime mover in the plan. He hopes that some short races can be added in order that a big program may be offered.

Owing to an unexplainable and inexcusable error an engraving of a Fiat 1906 motor on page 7 of The Automobile of January 4 was given the caption "Inlet side of Darracq motor, showing carbureter, magneto and low tension ignition mechanism." Doubtless readers who are well informed will have discovered the error for themselves, but this opportunity is taken to correct the error and prevent possible misunderstanding.

The practice of filling the space between mud-guards and body is gaining in popular favor, as this plan greatly increases the efficiency of the fenders.

One hundred thousand dollars' worth of motorcycles were sold by an Austrian manufacturer at a recent automobile show in Germany.—*Exchange.*

A garage proprietor is judged by the gasoline he keeps.

GENERAL VIEW OF INTERIOR OF THE PALAIS DU CINQUANTENAIRE DURING PROGRESS OF THE BELGIAN AUTOMOBILE SHOW.

THE AUTOMOBILE

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Two Miles a Minute.

The two-miles-a-minute automobile is no longer a matter of speculation, an even greater speed than this having been attained by two special racing cars on the last day of the Florida tournament, one an eight-cylinder 200-horsepower Darracq gasoline machine and the other a Stanley steamer with a rated horsepower of thirty but probably capable of developing under forced conditions, four or five times as much power.

The rate of highest speed therefore no longer belongs to the flanged metal wheel of the steam or electric railway but must be set down to the credit of the air-shod dirigible wheels of the automobile, the greatest average speed heretofore attained being the record of 127 miles an hour on the Berlin-Zossen experimental electric railway in Germany. This sensational record has been eclipsed by the performance of the Stanley special racing machine which Marriot drove over a measured mile on the Ormond beach in 28 1-5 seconds, or at the rate of 127.66 miles an hour.

In addition to the remarkable speed attained on the Berlin-Zossen road a record of five miles in two and a half minutes, a rate of 120 miles per hour, has stood since March, 1901, as the lowest recorded mark in steam railway sprints. This best American speed record, strangely enough, was made in the state of Florida between Fleming and Jacksonville by the Plant System and the new world's record for any type of vehicle or means of transportation still reposes in the same state.

Whether or not the limit has been reached depends quite as much on the factor of human endurance as on the further refining of the mechanism of the automobile, the difficulties of guiding a car even on such a smooth surface as the beach at Ormond being enormously increased at each further reduction in the speed below the figures now established.

In this connection it is but fair to state that the two successful cars are, strictly speaking, racing machines, pure and simple. Neither suitable for use on ordinary country roads as pleasure vehicles (without extensive shop alterations, if at all). The Stanley is built with very slight clearance and would undoubtedly lose many characteristic qualities if it were rebuilt along standardized lines, while the big Darracq is designed for sprint racing, preferably on a comparatively straight course, being made with drive direct to the rear axle without the interposition of the usual differential gearing.

In view of the popular deductions from the results of the beach races, it would seem advisable to provide a classification which would segregate each type, providing a class for the gasoline, the steam and the electric cars, so that the results would be of actual worth in a commercial way rather than affording speculation as to the relative merits of widely different types. The radical difference in the sources of energy of the steam and gasoline-driven car lies in the possibility of the abnormal power developed in the former by reason of the "bottled up" energy of steam under high pressure, a condition not present in the explosive motor in which power is generated only as used.

The foregoing is not to be taken as in any way a detraction from the merit of the marvelous performance of the Stanley and Darracq cars which have placed the record for the fastest miles ever traveled by man to the credit of the automobile, and the suggestion is offered only in the belief that its adoption will advance the progress of the industry.

*

How Many Brakes Are Needed?

An article worthy a careful perusal is "The Automobile in America," reproduced in this issue of THE AUTOMOBILE from the January issue of *The Munsey* magazine. As emanating from the pen of Frank A. Munsey, publisher of no less than four monthly magazines of wide circulation, and a man whose originality and habits of close observation have placed him in the front rank of the world's most successful publishers, his discussion of the self-propelled vehicle is of far more than passing interest.

Mr. Munsey writes, not as the skilled constructor, but as the student and close observer. He speaks authoritatively as a user of the automobile, having been won to the expediency of the motor car by its adaptability as a mode of conveyance both here and abroad. As an owner of cars of the best foreign manufacture, he is qualified to write, as he does, of the relative merits of the American and foreign machines, and his hopeful note of patriotism for the American machine has already been fulfilled in the increased care of our makers in the choice and successful incorporation in the finished product of materials of the highest obtainable quality.

In one particular we wish to take issue with Mr. Munsey, and that is in the matter of brake equipment, not, however, with the idea he means to convey—that a car should be fitted with efficient brakes—but, rather, with his plea for a relay of brakes. It is pretty generally accepted practice to fit at least two brakes, or two systems, to a car; one for regular service and one for emergency use. This practice has in a number of cases been followed by the use of a third brake, and at least one example was noticed at the recent New York show where separate pedals were fitted to act independently on two service brakes on the transmission, with the usual emergency brakes on the rear wheels.

From practical experience in general road driving and touring it would seem far easier to keep the usual two braking systems at their maximum efficiency than to keep a greater number so tuned up that each is at its best when called into action. Then another factor enters into the question, the reliability of the driver. A multiplicity of efforts are never so well directed as a few, be the efforts simultaneous or progressive, and in such cases as call for the sudden stoppage of a car the best driver will suffer from confusion if his efforts are divided instead of confined in one, or at least in two, directions.

As the most successful emergency stops are usually made in far less time than can follow a carefully planned effort, it is highly probable that the result is attained through a sub-conscious action, the result of practice and familiarity with the mechanism of the car. If this is so it follows that no material advantage can be gained by adding brake systems, and on the other hand a positive disadvantage would result, for the driver would place too much dependence on at least one of the many systems remaining in effective working order and grow careless in the needed inspection of each. And, again, as an engineering proposition, it is bad practice to use more mechanisms for the accomplishment of a result than the necessary minimum number.

The Next Great French Road Race.

The selection by the Automobile Club of France of the Sarthe Circuit for the Grand Prix race seems to be an unusually happy decision as this circuit provides more advantages than any route hitherto used for a big road racing event in Europe. In addition to the many things in favor of the Sarthe circuit, such as its unrivalled surface, its proximity to Paris and the character of the country in which it lies, the disadvantages of the course are practically nil, the inhabitants of the district being favorably disposed towards automobilists and racing and the policing of the course being easy by reason of the close proximity of an army corps.

The French manufacturers are elated over the outcome of the deliberations of the Club and no less than nine representative concerns will enter three cars each, thus assuring a large field of starters without the consideration of foreign entrants, though it is confidently expected that these will be forthcoming at an early date.

The favorable character of the course may be understood when it is stated that two rounds of the triangular circuit make a total of approximately 375 miles, and the only villages to be passed will be practically eliminated from consideration by means of barriers so that maximum speeds may be maintained throughout the course.

The new regulations providing that all repairs, tire replacements, filling of tanks and other attentions to the cars must be made by the driver and his assistant will not only remove from the big road race the picturesque element of tire repairs by trained experts and tank filling by roadside assistants but will provide an event more nearly parelleling actual touring conditions except in the matter of speed.

The lengthening of the event to a two days' contest, two rounds for each day, will provide an adequate endurance test for the cars entering, and the manufacturer making a good showing under the conditions of the race will earn a reputation for endurance which should be of material value in the disposal of his product.

In addition to the conditions governing the event the character of the road must be taken into account, one leg of the triangle is comparatively level, another with slight grades and stiff hills and the third is nearly all through hills with grades sufficiently steep to try out both car and driver. The width of the entire course is sufficient to admit of contestants passing and in one portion a straight stretch of twenty-two miles is found, so that the highest speeds may be attained.

In all ways the Grand Prix should provide the best road racing event that has yet taken place in Europe and the event is popular with the French industry.

It is certainly to be hoped that America will be adequately represented.

Seven Auto Bills in Massachusetts Legislature.

BOSTON, Jan. 29.—The usual grist of automobile legislation is now before the Massachusetts General Court and in the course of the next few weeks the grinding will begin. Seven bills have been entered and are before the Committee on Roads and Bridges, which will soon give hearings upon the proposed changes in the law. Of the seven, five are in the interests of the automobilists; one will probably not meet with their opposition, but the seventh will come in for general denunciation. This is a proposed law which would require every automobile to be equipped with a gong which would ring at every revolution of the wheels. The prospect of such an imposition upon the nerves not only of the automobilists but of the people who dwell along the highways, is disagreeable to contemplate. The bill reads:

"Every automobile or motorcycle used or operated in this Commonwealth shall be equipped while in use with a gong or bell which shall sound or strike at every revolution of the wheels, and which shall be of a pattern approved by the Massachusetts Highway Commission." A penalty of from $25 to $50 is fixed for violation of the measure.

There are two bills relative to the speed of automobiles. One, fathered by Senator Daniel W. Lane, proposes an increase of speed on all highways except park drives, from fifteen miles to twenty miles an hour outside the limits of a city or the thickly settled or business part of a town, and from ten miles to twelve miles an hour within those districts, with the old speed of eight miles at corners and crossings.

This bill carries with it an interesting definition of the phrase "Thickly settled or business part of a town." This definition is as follows: "(a) The territory of a city or town contiguous to a public highway which is at that point built up with structures devoted to business; (b) the territory of a city or town contiguous to a public highway not devoted to business, where for not less than one-quarter of a mile the dwelling houses on such highways average less than one hundred feet apart, and also (c) the territory outside of a city or town contiguous to a public highway within a distance of one-half a mile from a postoffice, provided that for a distance of at least one-quarter of a mile within such limits the dwelling-houses on such highways average less than one hundred feet apart."

The other speed bill permits the Highway Commission to establish the rates of speed with a maximum limit of twenty miles outside thickly settled districts and twelve miles inside. This bill provides for the posting of notices of the legal speed at which automobiles may be driven over a given highway until the next sign is reached.

A bill which is in accordance with the wish of automobilists to prevent petty persecution by the country constables and which is also in line with the recommendation of Governor Guild, provides that fines received for violation of the automobile law shall be used for the maintenance and construction of highways. It also contains a clause under which the fees for automobile registrations and licenses shall be used to defray the expenses of the registration and licensing, and the balance shall be used for the maintenance and construction of state highways. There is another bill which also provides for the payment of all fines to the state and their use by the Highway Commission on state highways.

Still another measure which will have the support of the automobilists is intended to annul that part of last year's law which gave the selectmen of towns and the city councils of cities the right to exclude automobiles altogether from certain highways. Many towns took advantage of this part of the law and there are now numerous highways upon which automobiles cannot be driven. The authority to exclude automobiles is vested by the bill in the Highway Commission which cannot close a highway without public notice and a hearing. The other bill gives the Highway Commission the right to make such rules and regulations as it finds necessary for the government of automobiles, but does not permit the Commission to make speed regulations.

OHIO AUTO BILLS.

Measures Providing for Oiling Roads and Registering Cars Introduced.

COLUMBUS, O., Jan. 27.—Several bills of particular interest to automobilists have been introduced at the present session of the legislature at Columbus. Two of these measures introduced in the House of Representatives by Representative Paxton provide for the sprinkling of city, county and national wagon roads with oil to lay the dust, the cost of the work in the cities to be borne by abutting property owners and the municipal corporation, while the cost of the work on county roads is to be paid out of the road funds.

A voluminous bill relating to automobiles and other motor vehicles has been introduced in the General Assembly by Representative Sawicki, of Cuyahoga county. It requires owners and operators of all such machines to register with the secretary of state. A description of the machine, including the name of the maker, factory number and style is required. The registration fee is fixed at $2. Each machine must bear an aluminum seal issued by the secretary of state. A manufacturer or

dealer shall register one vehicle of each style or type manufactured or dealt in by him. Persons purchasing machines are allowed to operate them for five days without tag, while obtaining registration. Non-resident owners who have complied with the laws of their own states are exempt from the provisions of the act. The speed rate must not exceed one mile in three minutes outside of a city or village, or one mile in six minutes in any municipality. While crossing bridges, curves, etc., the speed must not exceed one mile in fifteen minutes. All machines must be stopped at request, or on signal by putting up the hand, from a person riding, leading or driving horses, and must remain so as long as shall be reasonably necessary to prevent accidents. In case of accident, the person operating the machine shall give his name and address, and if not the owner, the name and address of such owner.

Local authorities may set aside for a given time a specified public highway for speed tests or races, to be conducted under proper restrictions for the safety of the public. Each machine must be equipped with efficient brakes and a suitable bell, horn, or other signal device. At night two white lights must be displayed from the front of the car and a red light from the rear.

The measure prohibits enactment of local ordinances regulating automobiles subject to its provisions.

An unregistered chauffeur is prohibited from driving.

Violation of the act is punishable by a fine not exceeding $100 for the first offense, and punishable by a fine of not less than $50 nor more than $100, or imprisonment not exceeding thirty days, or both, for the second offense; and by a fine of not less than $100 nor more than $250 and imprisonment not exceeding thirty days for a third or subsequent offense. For minor violations the fine is from $25 to $50 for the first offense, and from $50 to $100 or imprisonment for ten days, or both, for subsequent offenses.

Representative Smith, of Wyandot, has introduced a bill requiring the registration of all automobiles for a fee of $1.00 each and providing that autos owned by non-residents cannot be operated in Ohio until the owners have registered and paid the fee.

The text of the measures is as follows:

Section 1. Any person being the owner or operator of an automobile, or other motor vehicle operated by steam or electricity, shall, before running or operating it upon any of the highways of this state, make application in writing to the secretary of state to have the record herein provided for made, which application shall state the name and post-office address of the owner, factory number of his machine, if any, and capacity of speed, together with a fee of one dollar.

Section 2. The secretary of state shall, on the receipt of such application and said fee, enter in a record kept for such purpose, and no other, the above-required application, and give the consecutive number, beginning at one, and issue a certificate of such entry under seal of his office, to such owner of said automobile, or motor vehicle, or mail the same to his address, if required, which shall be received in any court as proof that this provision requiring record has been complied with.

Section 3. Before any automobile owned by a person not a resident of this state can be lawfully operated on any of the highways of this state the owner shall make application to the secretary of state for recorded number as provided in section one of this act.

Section 4. Whoever operates his automobile on any of the highways in this state shall have displayed in plain figures, in good proportion, and not less than three inches in height, which shall be on such automobile in print thereon or by placard attached thereto, in plain view both in front and rear.

Section 5. Whoever operates any automobile on the highways of this state without complying with this act shall be deemed guilty of a misdemeanor, and any person who may be found guilty of a misdemeanor under this act shall be fined in any sum not less than twenty-five dollars nor more than one hundred dollars, which fine shall be expended for the benefit and improvement of highways in the township or municipality where such arrests have been made, and any justice of the peace or mayor of any municipality shall have final jurisdiction under this act.

Section 6. All fines and costs assessed against any person found guilty of violating any provision of this act shall be a first and best lien on and against the automobile used, operated, or run in violation hereof.

OBNOXIOUS WASHINGTON BILL.

Automobile Club of Capital Preparing to Fight Absurd Regulations.

WASHINGTON, D. C., Jan. 27.—The Automobile Club of Washington has an excellent opportunity to demonstrate its usefulness in fighting obnoxious automobile legislation by bringing all its influence to bear against the Sims bill regulating the speed of automobiles in the District of Columbia.

This bill, introduced in Congress this week, and now pending in committee, provides in effect that no person shall drive any automobile within the fire limits of the District at a greater rate of speed than twelve miles an hour between intersecting streets; nor across streets on which there are no railroad or street railway tracks at more than six miles an hour, nor more than five miles an hour across any intersecting streets on which there are railroad or street railway tracks, nor more than four miles an hour around corners.

The most obnoxious feature of the bill lies in the fact that there is a provision that the rate of speed on certain streets in the business section shall not exceed four miles an hour. These streets are specifically mentioned in the bill, and to keep within the strict letter of the proposed law every automobilist would need a chart showing where to slow down to the required speed.

The bill further provides for a speed of not more than fifteen miles an hour outside the fire limits, and contains a provision that the car must at all times be under the control of the driver or operator.

Penalties for violations are provided as follows: "The driver or operator and the owner or proprietor riding thereon or therein violating any of the provisions hereof, shall, upon conviction for the first offense, be fined not less than $5 nor more than $50, and shall, upon conviction for the second offense, within one year from the commission of the first offense, be imprisoned for not less than ten days nor more than one year."

Prosecutions for violation of the provisions of the proposed law shall be on information filed in the police court by the corporation counsel or any of his assistants.

It is the intention of the A. C. of Washington to put up a strong fight against this bill, and plans are now being made for the fray.

OPPOSE PROPOSED ORDINANCE.

DETROIT, MICH., Jan. 29.—Local automobile men are aroused against certain of the aldermen who introduced the ordinance declaring it a nuisance to permit gasoline and oil drippings from automobiles to fall on the city pavements, and providing a fine as penalty.

Through the influence of some of the leading automobilists of the city it has been possible to have the matter referred back to a committee, so that there is no danger of molestation until after the coming automobile show, at least.

"Fighting" John P. Schneider, the aldermanic autoist who, a couple of years ago, wilfully violated a new speed ordinance to make a test case, had donned his armor again and a vigorous fight is likely to ensue on the grounds of class legislation. Dealers believe that such an ordinance would be a great blow to the local industry if put into effect.

SUIT FOR DOCTOR'S SERVICES.

BUFFALO, Jan. 29.—The deplorable accident at Kenilworth Park during the automobile races last August, when Webb Jay and his machine crashed through a fence, causing almost fatal injuries to the driver, is recalled to memory by papers which were filed in the office of the county clerk this morning in a suit brought by Dr. Herman E. Hayd, of Delaware avenue, against the White Sewing Machine Company. The company owned the racing machine driven by Jay when the accident occurred. The action is for $1,000 for professional services rendered by Dr. Hayd for the injured driver. 100 visits charged for at $10 a visit.

It is not necessary to use winter oil in warm weather just because it is the winter season.

OFFICERS OF THE N. A. A. D.

Recently elected officers of the National Association of Automobile Dealers', incorporated under the laws of the State of New York, are: F. G. Smith, Jr., president; W. L. Githens, vice-president; H. C. Wilcox, secretary and treasurer, W. H. Baker, general counsel. The purposes of the association, are "the betterment of trade conditions, the benefit of the individual dealer in various ways, and through representation of its members in a compact body, to co-operate with the manufacturers to secure the stability of both the manufacturing and distributing branches of the industry."

SYRACUSE CLUB ELECTION.

SYRACUSE, N. Y., Jan. 27.—As a result of the annual meeting of the Automobile Club of Syracuse, Willett L. Brown was unanimously chosen to succeed himself for a second term as president. Secretary and Treasurer Forman Wilkinson was also re-elected, having been very active in the club's interest. C. A. Benjamin was elected first vice-president and H. W. Smith second vice-president.

Treasurer Wilkinson's report for the past year showed the most successful twelve-month the club has had. There is a snug balance in the treasury. There is an increase in membership of 31 over last year, there now being 102 active members. There were 71 at this time last year.

A committee was named by the president to look after the placing of road and danger signs this spring, the committee being J. W. Cronin, R. E. Kolbe, W. H. Bex and S. Silverman.

The date of the fourth annual banquet was set for February 12. An effort will be made to secure as one of the speakers Dave H. Morris of New York, president of the Automobile Club of America. It is expected that C. Arthur Benjamin will be toastmaster. The affair will be held at the Yates Hotel in this city. The committee in charge consists of Howard K. Brown, Frederick H. Elliott, Clarence West, Willett L. Brown, and Forman Wilkinson. As February 12 is Lincoln's birthday and a holiday, a large attendance is expected.

NEWS NOTES OF THE CLUBS.

HAGERSTOWN, MD.—This city has an automobile club of forty-one members. The club has done some aggressive work for the cause of automobiling, and has handled matters so that the public is not antagonistic.

WORCESTER, MASS.—A meeting of the legislative committee of the Massachusetts State Automobile Association was held in Worcester recently. This committee is composed of the presidents of seven clubs of the state. There was a general discussion of the state automobile laws, how they might be improved, and the stand that would be taken by automobilists throughout the state regarding the bills affecting them that are to come up before this legislature. The meeting was held in the Worcester Automobile Club quarters on Front street.

PITTSFIELD, MASS.—At the annual meeting of the Berkshire Automobile Club of Pittsfield the following officers were elected: President, Franklin Weston; first vice-president, S. G. Colt; second vice-president, C. F. Bishop; secretary, R. A. Parker; treasurer, L. A. Merchant; recording secretary, E. H. Kennedy. The members of this club have done much toward posting the highways in their part of the state, and are now considering a movement to oil certain roads, notably that connecting Lenox with Pittsfield.

WORCESTER, MASS.—At a meeting of the membership committee of the Worcester Automobile Club, held in the new club-rooms last week, thirty applications for membership were voted upon favorably. Another batch of names is ready to be acted upon at another meeting which the committee intends to hold shortly. The membership now has reached 265. There has been a remarkable increase in the last two months. The new quarters, which were opened about a month ago, have already been found inadequate for the requirements of the club members, and it was voted to have an addition made. More ladies' parlors will be provided in the addition, as well as another dinner room. The addition will be ready for occupancy, it is expected, by February 1.

MICHIGAN GOOD ROADS ASSOCIATION

FLINT, MICH., Jan. 29.—The Michigan Good Roads Association was organized at a convention held here on January 25, which was attended by about fifty delegates from eleven different counties in the state. Among the delegates were Mayor W. W. Todd, of Jackson; Mayor S. D. Brown, of Lapeer, and J. W. Kerns, road commissioner for Saginaw county. Officers were elected as follows:

President, W. W. Todd, Jackson; vice-president, H. W. Davis, Lapeer; secretary, Dr. Rachel J. Davison, Flint; treasurer, B. F. Ross, Ypsilanti.

An executive committee and a vice-president for each county were also named.

Following the organiation of the association resolutions were adopted demanding, among other things, that in future a just proportion of the money contributed in taxes to the state and nation by farmers be returned to them for use in making good roads, and that appropriations made by the Michigan legislature for road improvements in the state shall provide a fixed sum for each county, based on its assessed rural valuation.

The resolutions also favor the adoption of the township and county systems of road building, and invite state and national agricultural associations to offer premiums for excellence in road building and the naming of country roads on the marker system.

SEASON OPENING IN TACOMA

TACOMA, WASH., Jan. 24.—All the automobile agencies here are being kept busy at present demonstrating the qualities of the 1906 cars. The rainy season is not so persistent now as it has been, and as spring weather is in prospect, some thought is being given to the auto. On particularly pleasant days there are rushes toward the garages, and the men in charge have all they can do to give the demonstrations wanted.

Business prospects are better than ever; several machines have already been sold. There is no doubt that the trade will improve this year in Tacoma as well as in all the Puget Sound cities. The only trouble anticipated is being able to get machines for all who wish to buy. This is understood to be the case with the smaller machines, as the reports received here are to the effect that the factories are flooded with orders. But a few 1906 machines are already seen on the streets.

The auto-boat business is also improving rapidly, and the people of the Sound are commencing to appreciate the unusual opportunities here. Power boats are manuactured here, so that it is not necessary to rely upon filling orders in the East. As a usual thing the Sound is quiet, and such storms as one hears of along the Pacific seaboard do not extend into this part of the country.

The recent agitation among American manufacturers regarding comparative values of steel for automobile purposes has disclosed some interesting data concerning this much-used metal. The strength of steel is measured and expressed in pounds per square inch. There are four grades. Low carbon steel will show a tensile strength of 60,000 pounds with an elastic limit of 40,000 pounds. The next grade, high-class carbon, shows 85,00 pounds tensile strength and 55,000 pounds elastic limit. Nickel steel annealed gives 85,000 pounds tensile strength and 60,000 pounds elastic limit. With special treatment its showing will be 100,000 and 70,000 respectively. The chrome nickel steels are the highest grades and will test at 90,000 and 65,000 pounds annealed and 250,000 and 150,000 with special heat treatment. This grade is being used in the Pope-Toledo construction. The maximum commercial limit that has been reached in chrome nickel steel is 275,500 pounds tensile strength and 183,000 elastic limit.

The city council of Vienna has authorized the transformation of the three municipal chemical fire engines into motor-propelled engines, and also the acquisition of a motor fire transport wagon.

Manufacturers of non-freezing compounds must be up against hard times.

Modern Plant for Pierce Automobiles.

BUFFALO, Jan. 29.—Plans are being prepared for a large new automobile factory for the George N. Pierce Company, of this city. It is expected that the new plant will be ready for occupancy next fall. It is to be located on the east side of Elmwood avenue and on the south side of the New York Central belt line tracks, where the company recently purchased fifteen acres of land. Excellent railroad facilities will be right at the door of the new plant.

The Pierce company intends to have one of the most complete and modern factories in the country. Lockwood, Green & Co., mill engineers of Boston, are engaged in preparing the plans, but matters have not yet progressed far enough to indicate the nature of the buildings to be constructed.

The Pierce company expects to have 250,000 square feet in the new plant and to be able to manufacture 1,000 automobiles annually, giving employment probably to between 700 and 800 workmen. The new factory will increase the output of the company by about 300 cars. As soon as the new factory is completed the company will abandon its Hanover street plant and the annexes on various streets in the neighborhood, and co-ordinate all of its automobile and bicycle business in the new building.

"All that is to be said about the matter at this time," said Treasurer Charles Clifton, "is that we have outgrown the factory in Hanover street and have decided that our business requires a more modern and commodious plant. We have purchased fifteen acres of land on Elmwood avenue and the Boston mill engineers are drawing up the plans for the new factory.

"Nothing has been decided as yet, relative to the nature of the buildings which are to be erected, except that we expect to have a practically fireproof factory. The essential thing to be determined first is the arrangement of the plant, so as to procure the greatest effectiveness, after which the determination of the character of the buildings can be speedily reached. Our present plant in Hanover street is spread out in several buildings in the neighborhood, and the workmen are really in each other's way. We aim to have things so arranged in the new plant that we can greatly increase our output without materially increasing the number of men employed. We expect the plant will be ready for occupancy next fall."

HELD SHOWS OF THEIR OWN.

PHILADELPHIA, Jan. 29.—With a fortnight intervening between the New York and Chicago shows, several local concerns, one or more of which does not contemplate exhibiting at the local show, took advantage of the interval to promote individual exhibitions at their several salesrooms last week. To add éclat to these affairs, the New York exhibits of the cars they represent were shipped *in toto* to this city. The local staffs of these concerns were reinforced for the week by experts from the factories, and the results of the innovation are said to have been gratifying.

The concerns so exhibiting were the Quaker City Automobile Co. (Franklin, Oldsmobile and the complete Pope line), the Foss-Hughes Co. (Pierce Arrow, Cadillac and Baker), and the Hamilton Auto Co. (Stoddard-Dayton and Corbin). The Quaker City company had upward of a score of complete cars and chassis on exhibition.

THE BOOM REACHES WINNIPEG.

WINNIPEG, MANITOBA, CAN., Jan. 24.—The Dominion Automobile Company, whose headquarters is in Toronto, will open a branch in Winnipeg this year under the management of W. C. Power, late of the Canada Cycle and Motor Co. The company will handle Winton, Fiat, Napier, Peerless, Packard, Pope-Toledo and Thomas cars. It is their intention to erect a fully equipped garage with a repair shop in connection, and to install a charging plant for electric vehicles.

The McCulloch & Boswell Company is making extensive alterations in its establishment to meet the growing business of the city, of which it handles a very large proportion.

Business prospects for the coming season are exceptionally good and prospective buyers are showing a tendency to invest in more powerful cars.

A movement is on foot to construct an automobile speedway between the city and Portage La Prairie, a distance of fifty miles over practically level ground. Should this project be carried through, the race for the Dunlop trophy, which will take place on the first Tuesday in September, will attract a large entry from the sporting members of the Winnipeg Automobile Club.

INCREASING FRANKLIN FACILITIES.

SYRACUSE, N. Y., Jan. 27.—It was given out this week that plans are being considered by the officers of the H. H. Franklin Mfg. Co. for increasing the capacity of the automobile plant 50 per cent., and it was stated yesterday that a new building would be erected shortly which, when completed, will permit of increasing the factory force by more than 700 men.

The growth of the company's business, which now employs a daily force of 1,300 men and a night force of 250, has been of immense benefit to this city and especially to the West End, where no vacant houses are now to be had.

The strip of land recently purchased by the company with a view to erecting another large building has a frontage of 100 feet on Gedden street and is 600 feet deep. The Franklin company feels the pressure of increased business, according to its officers, and more room will be provided as soon as possible. It has been necessary to rent an old broom factory near by for storage purposes.

The company is now running to the full capacity of the plant and the output for the years has been sold. Last Tuesday three carloads of automobiles were shipped to California over different routes, to determine which afforded the quickest service. Railroad men are watching this experiment with much interest.

A railroad switch has been laid into the company's yard, and the Delaware, Lackawanna & Western Railroad officials have been asked to consider plans for another switch, which should greatly improve the company's shipping facilities.

POWER INDUCEMENTS FOR PLANTS.

BUCHANAN, MICH., Jan. 27.—The power of the water of two western rivers may be offered as an inducement to locate automobile factories, one in the town of Buchanan, on the St. Joe river, and the other at Grand Detour, Ill., on the Rock river. A dam has been built at Buchanan to generate electricity for power and illuminating purposes. This power is offered to factories. Buchanan already has secured a number of industries on account of its power facilities. At Grand Detour a company has been incorporated and Congress has been asked to sanction the building of a dam. Grand Detour is an old historic town where years ago a pioneer plow-maker had his plant, which was one of the earliest plow factories in this country. Both towns have excellent railway facilities.

BUICK AND WESTON-MOTT PLANTS.

FLINT, MICH., Jan. 29.—The contract for the construction of the superstructures of the new buildings for the Buick Motor Company and the Weston-Mott Company, including a combined power house and offices, has been awarded. The figures of the successful bidder were $75,000 for the Buick and $45,000 for the Weston-Mott building.

The foundations are already in place and work on the superstructures will commence as soon as the weather is favorable. A large number of men will be engaged in the erection of the buildings and the contracting firm has agreed to have the Weston-Mott part of the contract completed by June 15. The Buick plant will be ready for occupancy by August 1. Both factories will be of mill construction and modern in every particular. They will be equipped with modern machinery, which will be operated by two engines of 300-horsepower each and a 450-horsepower generator.

The Weston-Mott Company, which will remove from Utica, N. Y., has sent word that a canvass of its employees shows that about 100 men will come here with the plant. The Buick company will bring several hundred mechanics and their families here.

RECENT INCORPORATIONS.

Mexican Automobile Co., of New York City, New York; to deal in engines and automobiles; capital, $100,000.

Standard Garage Co., Buffalo, N. Y.; capital, $10,000. Directors: L. F. Gentschl, W. C. Schultze and J. G. W. Knoll.

Inter-State Automobile Clearing Co., New York; capital, $50,000. Directors: C. A. Wardle, W. E. Metzger, G. H. Stillwell.

Manhattan Auto Car Company, New York; capital, $1,000. Directors: B. W. Wrenn, F. De C. Sullivan, S. M. Hartshorn.

The Powell-Bacon Company, Omaha, Neb., has amended its articles of incorporation, increasing its capital stock to $50,000.

Twentieth Century Motor Car Company, Chicago; capital, $10,000. Incorporators: L. F. Haupt, G. C. Marsh, E. F. Heywood, Jr.

Kreuger Automobile Company, Oshkosh, Wisconsin; capital, $10,000. Incorporators: E. Kreuger, W. H. Hathway and George Besnah.

Newark Motor Car Company, Newark, N. J.; capital, $100,000. Incorporators: Peter Broderson, James F. Kelly, G. H. Walters.

Thames Motor Co., Groton, Conn.; capital, $10,000. Incorporators: G. Pendleton, T. W. Avery, C. E. White, B. A. Copp and C. E Colver.

The Pay Car Motor Boat and Machine Company, College Point, N. Y.; capital, $50,000. Directors: E. P. Raynor, C. M. Gleason, Joseph Laughlin.

American European Automobile Touring Company, Monticello, N. Y.; capital, $150,000. Directors: C. E. Wemple, G. Y. MacTaggart, H. A. Taylor.

Graham & Goodman, Inc., New York; to manufacture automobiles; capital, $10,000. Directors: C. W. Graham, J. M. Graham and F. T. Goodman.

Breese, Lawrence & Moulton Motor Car and Equipment Company, New York; capital, $100,000. Incorporators: S. S. Breese, A. J. Moulton, H. C. Dickinson.

The Sharman-Ottinger Automobile Company, Salt Lake City, Utah; capital, $25,000. Officers: S. H. Sharman, president and treasurer; Adolph Ottinger, vice-president; A. Schneider, secretary.

Universal Motor Car Company, New York; capital, $500,000. Incorporators: F. E. Gunnison, M. R. Hutchinson, Walter Moffat, William Schek, G. L. Strong, Henry Cadenas, F. Blasenbrey.

Victor Electric and Manufacturing Company, Brooklyn, N. Y.; manufacture electric motors, etc.; capital, $100,000. Incorporators: John B. d'Homergue, L. P. Baldwin, Harry Hertzberg, W. P. Snyder, H. F. Ashbury.

Portland Garage Company, Portland, Me.; to deal in vehicles of all kinds; capital, $10,000. President, A. G. Frost; treasurer, H. R. Stickney.

News and Trade Miscellany.

The fourth annual banquet of the Hyatt Roller Bearing Co., of Harrison, N. J., was held at the Waldorf-Astoria, New York, on the evening of January 17, the grand ballroom being used for the occasion. About 200 guests were present, and an informal and exceedingly pleasant evening was spent. The dinner was followed by a vaudeville entertainment. The invitations to the banquet took the form of booklets, artistically gotten up, setting forth that the "Hyatt Idea" was to eliminate friction, not only mechanically, but socially.

Alexander Winton is planning to cruise extensively on the Great Lakes this summer in the *Lala*, a triple-screw, 65-ft. full cabin cruiser, which is being built for him by Lyman Bros., of Cleveland. Both boat and engine were designed by Mr. Winton. The engine is a twelve-cylinder Winton automobile engine, similar to the one placed in the Winton racing boat. The boat will have three staterooms, bathroom, grill room, cook's galley, and an electric lighting plant. A power tender will be carried on the deck.

It is expected that power boating will have a boom in Chicago this year. The Columbia Yacht Club, one of the leading organizations of its kind in the West, under whose auspices the Lipton cup races are held, is going to take up the sport in earnest.

A. Auble, owner and manager of a large garage in Akron, Ohio, expects to move into his new salesroom this week. He is agent for the Franklin, Winton and Oldsmobile.

After a long search for suitable quarters nearer the heart of Philadelphia's "Automobile Row," the Acme Motor Car Company, of Reading, Pa., has secured the first floor of the old market house at the northeast corner of Broad and Olive streets for a garage. Improvements are being rushed, and it is hoped to have the quarters ready for a formal opening within a fortnight.

The Rock Creek Automobile & Wagon Works, of Washington, D. C., has just secured a charter from the corporation commission of Virginia, and has begun operations in its new building on M street. Special attention will be given to automobile repair work. T. O. Probey is president, and the company is capitalized at $30,000.

Murray G. Livingston, chief police officer of Pittsburg, will station assistants at all the prominent points on the boulevards and East End driveways as soon as he receives from Harrisburg the list of Pittsburg automobilists who have taken out state licenses in compliance with the new law that went into effect January 1. Drivers whose machines have no numbers will be arrested without ceremony, and the speed limit of ten miles an hour will be enforced.

A circular sent out by the Mechanical Advisory Board Company, of Chillicothe, O., states that the company will supply expert advice on all mechanical matters.

The controversy over the ownership of the Pierce stanhope runabout, which was offered as a prize at a G. A. R. Bazaar in Buffalo in December, has been settled by Miss Mary Reyburn, who claimed the machine, relinquishing her claim in favor of that of the Daughters of the American Revolution, which organization also claimed the machine. The ticket winning the automobile bore Miss Reyburn's name, but the D. A. R. claimed it because the ticket was paid for by that organization when Miss Reyburn was reimbursed for her expenses in conducting an entertainment for the D. A. R. on one of the nights at the bazaar.

Now that the $50,000,00 good roads amendment has been carried in the New York state legislature, it will probably result in the establishment of a bureau of engineers, whose work will be devoted exclusively to the construction of good roads throughout the state. This plan will undoubtedly be endorsed not only by automobilists, but by all other users of the highways, as witnessed by the enormous vote in favor of the expenditure of the aforementioned sum.

At the third annual banquet of the Continental Caoutchouc Company, New York, given at the Hoffman House, New York City, Thursday evening, January 18, President Wily Tischbein, from Hanover, Germany, was the guest of honor. Many interesting business topics were discussed during the evening, and the affair was enlivened by musical numbers, including "Continental" talent.

The Mercedes Import Company has leased the north end of the ground floor of the Times Building, Times Square, New York, for an exhibition and salesroom.

L. J. Taylor and Jay Barnard, of Earlville, Ill., have formed a partnership, and have taken the agency for the Reo and Premier automobiles.

The A. W. Gump Automobile Company, incorporated with a capital of $25,000, is to open a garage and repair shop at 1118-1120 South Main street, Los Angeles, Cal. The prime mover in the concern is A. W. Gump, a well-known figure throughout the west in the bicycle trade, when this business was such a success.

The Hartford Rubber Works Company has adopted a method of testing its Hartford Dunlop and Clincher tires on special testing cars, which are run at least one hundred miles each day, irrespective of weather conditions, thus enabling the company to know at all times whether or not the tires are coming up to the standard which has been set.

One of the largest individual sales during show week in New York was that to Mr. Abraham, of the Brooklyn firm of Abraham & Straus, who purchased six Royal Tourist cars.

The Burtt Manufacturing Company, of Kalamazoo, Mich., manufacturers of the Cannon automobile, is preparing plans to more than double its capacity this spring. The company will put about $50,000 into new buildings and machinery. It is expected that the work will begin about March 1 and that it will be completed this summer.

Ralph Temple, of Chicago, has taken the agency in that city for the Hotchkiss car and will take ten of them on the first order. Manager Archer, of Archer & Company, is arranging for the Boston agency, for which there are a number of applicants, and for Buffalo. He cabled to Europe an additional order for fifteen cars during show week.

The Torbenson Motor Car Company, of Bloomfield, N. J., has contracted for the North Jersey agency of the Frayer-Miller car.

The resignation of Fred I. Tone as assistant general manager of the Marion Motor Car Company, of Indianapolis, has

been announced but his successor has not yet been named. Mr. Tone has accepted a position with the new American Motor Car Company, in the same city, as general manager.

The garage owned by the late S. F. Baskerville, at Canton, O., has been purchased by George Monnott and Joseph Sacher.

The American Motor Car Manufacturers' Association has issued a convenient book containing engravings and descriptions of the gasoline automobiles manufactured by the makers who are members of this organization. Specifications are given for 69 cars manufactured by 21 concerns; the information is given in uniform style in all cases, so that any desired feature can be referred to, and comparisons can be made without unnecessary trouble. The offices of the organization are in the Marquette Building, Chicago.

The Maxwell-Briscoe Company has offered a substantial cash prize to the pupils of the Philadelphia Academy of the Fine Arts for the most artistic and popular poster setting forth the merits of the Maxwell car. A number of competitors have entered the contest, the prize to be awarded to the design receiving the greatest number of votes from the New York automobiling public.

The Keystone Automobile Company of Pittsburg will build a tile power plant two stories high just outside its present building. A new 35-horsepower Westinghouse engine will be installed and a two-cylinder gas engine and generators will be part of the equipment.

The Wayne Automobile Station, at Washington, D. C., has been succeeded by the Commercial Automobile & Supply Co., recently incorporated under Virginia laws, with a capital stock of $20,000, fully paid in. The new company has been appointed District of Columbia, Maryland and Virginia agents for the Wayne and Logan gasoline cars and De Mar electrics. H. F. Woodward is president, and W. C. Long general manager.

The latest car to secure representation in Philadelphia is the Marmon, H. Bartol Brazier having secured the local agency for his concern, the Brazier Auto Works.

Barney Oldfield was in Cleveland last week, ararnging with the Peerless Motor Car Company to build him four new cars. Oldfield said that two of these will be special machines designed for stage work in his production, "The Vanderbilt Cup," which has made a hit in the East. He is going abroad with this act, and expects to show in the Hippodrome in London and the Folies Bergere in Paris. The other two cars are for road racing, and Oldfield says that he will drive in the Vanderbilt cup race next fall. The new cars will be of higher power than anything heretofore built by the Peerless company, he says.

The National Leather Tire Co., of Owosso, Mich., makers of leather tires for automobiles, has been reorganized, E. F. Dudley retiring. The new company is known as the Salisbury Tire Company. The glove and legging business formerly conducted by the Salisburys in this city has been discontinued and the leather tires will be manufactured in the factory building, which will be greatly improved.

R. H. Beacham & Son, proprietors of a livery stable in Portsmouth, N. H., have closed negotiations with the Olds Motor Works for six automobiles, all of 1906 model, to be used in connection with their livery business. H. L. Beacham, junior partner of the firm, has had two Olds cars in use since last season.

Twelve power boats, now under construction, will soon be added to the already numerous fleet of small craft which promises to enliven things on the Piscataqua river, at Portsmouth, next summer. That some of the new boats are built for great speed increases the interest of the many skippers of the fleet, who predict great events in autoboat racing next season.

The Diamond Rubber Company is putting out a mechanically fastened rim for clincher tires. It is known as the Marsh rim, but was invented and patented by Richard S. Bryant, of the Bryant Steel & Rim Company. The special claim made by the Diamond company for this rim is simplicity of manipulation and security. The Diamond company has also just begun to exhibit at shows a diaphragm or non-puncturable tire. It is constructed on the principle that if the outer tire is penetrated the diaphragm arrangement will prevent the escape of air.

Although the present Broad street quarters of the Eastern Automobile Company, Philadelphia agent for the Peerless, were considered quite adequate when they were opened, about a year ago, it has been found necessary to almost double the floor space by taking four small adjoining buildings. Manager Thompson claims that when the necessary improvements are completed, the Eastern company will have the largest ground-floor area of any garage on Broad street.

The Oxford Automobile Company of Oxford, N. Y., has increased its garage facilities for the coming season, and will carry a larger stock of parts and supplies. It has taken the agency for the Pope-Hartford and Pope-Tribune cars for Chenango county.

Arthur Benjamin, who has been connected with the H. H. Franklin Mfg. Co. since 1902, has severed his connection with that concern, and hereafter will be connected with the Babcock Electric Vehicle Company of Buffalo. Mr. Benjamin was one of the promoters of the Automobile Club of Syracuse, and was active in its interest and popular among the members of the club.

C. D. Van Schaick has secured the New York agency for the cars manufactured by the Covert Motor Vehicle Co., of Lockport, N. Y. His New York office will be located at 72-74 Beaver street, with a branch office in Mount Vernon, N. Y., at 185 South Eleventh avenue.

The Barber Automobile Garage, William Barber manager, will open in Brooklyn on February 1, at 224-226 State street, near City Hall, and will sell and maintain automobiles.

The Baldwin Chain & Mfg. Co., Worcester, Mass., to meet the demands of its growing business, has purchased what is known as the Kent factory, at the corner of Chandler and Bellevue streets, Worcester. The building is four stories high, and there is plenty of vacant land for extension.

At a recent meeting of the board of directors of the Diezemann Shock Absorber Co., Hoboken, N. J., the following officers were elected: Sam Fisher, president, to succeed M. C. Anderson; Henry Fisher, vice-president and manager, to succeed Carl Bomeisler, who was elected to the office of secretary and treasurer, to succeed Halcott Anderson.

The Rock Island Battery Co., whose plant was entirely destroyed by fire early this year, announces its ability to take care of all orders, and states that its new plant will be larger and finer than the old one. Temporary offices of the company are at Third and Vine streets, Rock Island, Ill.

The Frayer-Miller Motor Car Co., New York, has rented Harry Houpt's garage at Forty-ninth street and Seventh avenue, New York, and will take possession of the building when Mr. Houpt's new garage on Broadway is completed.

It is the present intention of the Maxwell-Briscoe people to enter a four-cylinder car in the Vanderbilt race next season, even if that event is held abroad.

Because of numerous protests received by the commission in charge of the Glidden Tour arrangements, regarding the poor roads in Canada, the Canadian section has been eliminated from the route of the next tour. Just what the exact route will be has not yet been finally settled.

The Cadillac car will be represented in La Salle and De Kalb counties, Illinois, by Smith's Agency and Auto Garage, with headquarters in Earlville, Ill.

R. Goodman, of South Union, S. C., senior member of the Goodman Cycle Company, died at 6 o'clock on the morning of January 20, after having been in ill health for some time. Mr. Goodman was sixty-one years old. His business will likely be carried on by his son, E. F. Goodman, who has been the junior and active member of the firm for some time.

One of the most interesting features of the Detroit auto show will be the exhibition of a twenty-passenger sightseeing car made by the Rapid Motor Vehicle Company, of Detroit.

C. E. Gray, of the Gray-Hawley Mfg. Co., of Detroit, Mich., has perfected a new horn for automobiles, to be blown by the exhaust. It has a single tube, bell crowned, and screw fastened. There is no soldering and no slots in which dust can accumulate. The interior is arranged to give three distinct sounds, the intensity of which may be moderated at will.

Max La Roche, of the La Roche Automobile Company, Philadelphia agents of the Studebaker, celebrated the Chinese New Year by treating the local Mayor of Chinatown, the Chinese consul, and other Celestial celebrities to an automobile tour of Fairmount Park and the suburbs.

Otto Nestman, who has successfully piloted the Stevens-Duryea racing machine in many track, beach, and hill-climbing contests, has abandoned the sporting end of the industry, and become a partner in the Holyoke Automobile Garage, Holyoke, Mass.

The International Motor Exhibition, E. M. Wilcox manager, opens in Toronto, at the Granite Rink on Church street, March 31, and will continue to April 7. The show will include exhibits of automobiles, accessories, power boats, and marine engines. All the lines of automobiles represented in Canada will be shown.

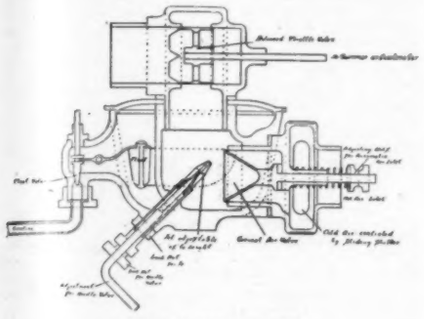
The Marion Motor Car Company, of Indianapolis, has appointed the Morrison-Tyler Motor Car Company, of Boston, the New England agent for Marion cars. The company will control the agencies of five states, namely, Massachusetts, New Hampshire, Vermont, Rhode Island and Maine. They have placed a large order for Marion cars.

J. A. Clairmonte had secured the agency for the English and American Napier cars, covering the southern California agency. A garage and wareroom will be erected on Spring and Seventh streets, Los Angeles, where Mr. Clairmonte will make his headquarters.

D. M. Dearing and P. B. White, of Jackson, Mich., are organizing a company to manufacture children's automobiles. The factory will be located at Leslie, Mich.

INFORMATION FOR BUYERS.

MORGAN CARBURETER.—The carbureter illustrated by the accompanying line engraving, and manufactured by B. Morgan, John street, Newport, R. I., is of the type in which the float chamber surrounds the mixing chamber, the spraying nozzle being in the



MORGAN CARBURETER.

center of the system so that the height of gasoline in the nozzle is unaffected by changes of level, whether the car is running up or down hill, or is, for any reason, tilted sideways. The float is of horseshoe shape and partly surrounds the mixing chamber; it is hinged at the rear end and an arm, extending back of the hinge, acts on the stem of the gasoline inlet valve. The various parts and their functions are indicated in the drawing. An advantage of this carbureter is that the piston throttle valve, which in the engraving is shown on the top of the carbureter, may be placed in almost any position to suit the motor and the space available. For instance, the throttle may be placed on top with its rod vertical; on the side of the carbureter, with the rod horizontal or vertical, pointing in any direction. Adjustments are provided for the hot air supply, and cold air supply, the height of the spray nozzle, and the quantity of gasoline fed to the nozzle, and the main air supply. The gasoline valve can be ground in position. The carbureter may be attached, by screwing to the pipe, by a half union or by flange. A boss is cast on the body so that it can be attached to a bracket.

AUTOMOBILING OUT WEST.—A picturesque mixture of automobile, cow-puncher, Indian and tepee is depicted in the handsome 1906 calendar issued by the Olds

REPRODUCTION OF OLDS CALENDAR FOR 1906.

Motor Works, of Lansing, Mich. The calendar takes the form of a large colored picture of a western scene, an Oldsmobile touring car in the foreground and a group of braves and squaws curiously examining the strange vehicle. By way of contrast, an Indian on a typical prairie pony is very effective. The cow-punchers in the front seats of the car do not look at all out of place—in fact, the effect is to make one wonder if a cowboy costume would not be the right thing for the chauffeur to wear. The picture is the work of George Gibbs, and its quiet coloring and good composition make it quite attractive.

HAM OIL LAMPS.—A novel and very appropriate catalogue of oil lamps has been issued by the C. T. Ham Manufacturing Company, of Rochester, N. Y., illustrating and describing the Ham "cold blast" oil lamps for automobile work. The catalogue is made in the form of a lamp, of a real "brassy" color, and the cover opens like the front door of a lamp, showing the burner inside and, further in, the pages carrying the illustrations and descriptions are found, all lamp-shaped. The Ham lamps are said by the manufacturers to be particularly adapted to hard work in rough weather; they are made with a view to remaining lit regardless of wind and weather conditions. The catalogue deals with oil lamps exclusively.

HOFFECKER SPEED INDICATOR.—The demand for a reliable speed indicator for automobile use has induced a number of manufacturers to design and place on the market such instruments. One of the latest

HOFFECKER SPEED INDICATOR DIAL.

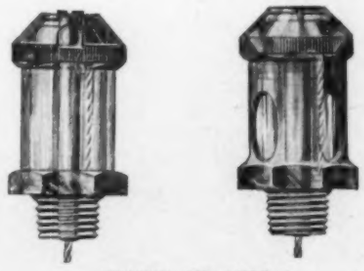
is the Hoffecker speed indicator, manufactured by the Rollins Mfg. Co., of Park Square Motor Mart, Boston, Mass. This instrument has a dial with two scales and two pointers. One pointer, ranging over the inner scale, indicates speed in miles per hour, while the second pointer is longer, traveling over the outer scale, which serves the purpose of a trip odometer, reading up to 100 miles, after which it can be turned back to zero by a knob. A total odometer, reading up to 99,999 miles, exhibits its figures through a small window in the dial. The instrument is driven by a flexible shaft running in a brass casing. It is made in three sizes—3 1-2-inch dial, 4-inch dial and 4 1-2-inch dail, the maximum speed indicated being 50 miles an hour in each case. The instruments are dust and water proof.

SPEEDOMETER FOR 1906.—The Jones Speedometer in its 1906 form has a very convenient method of making connection with the flexible driving shaft. As the illustration shows, the shaft is attached to a fitting at the side of the speedometer case, so that it can be brought up through the floor of the car, passed through the dashboard, or arranged in almost any way; the instrument may be attached on the right or the left side. The angle bracket attached to the dashboard permits the instrument to be set with the dial at any angle, there being a joint for this purpose. The

1906 JONES SPEEDOMETER.

speedometer is made in a number of styles—plain speedometer, combined speedometer and odometer, combined speedometer, total odometer and trip odometer; also a plain odometer. The 1906 catalogue issued by the manufacturer, Jos. W. Jones, of 127 West Thirty-second street New York, illustrates and describes the various styles and gives their capacities, prices, details of attachment and driving gear and so on.

TUCKER OIL CUPS.—The importance of properly lubricating small fast-running journals has led C. F. Tucker, of Hartford, Conn., to design a series of small sight-feed oil cups especially for such work. Two of these cups are illustrated herewith, one having a glass cup protected by a brass shield, and the other having no such protection. The cap which closes the top of the cup can be partly rotated, its motion being limited by stops. When the cap is moved through half its range it uncovers two ports, one for the introduction of oil and the other for the escape of air. When moved against either of the stops the ports are closed and dustproof. The feed to the bearing is by capil-



TUCKER OIL CUPS.

lary action. Each style is made in four sizes, viz.: 9-16, 11-16, 13-16 and 15-16 inch in diameter. They are of brass with hexagon bases.

It is rumored that the plant of the Owosso Carriage Company, at Owosso, Mich., is to be utilized as an automobile factory.

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